THE LIFE-WORK
OF
LORD AVEBURY
(SIR JOHN LUBBOCK)
1834-1913

COMPRISING ESSAYS BY

SIR BERNARD MALLET, K.C.B.
SIR ARTHUR KEITH, F.R.S.
DR. A. SMITH WOODWARD, LL.D., F.R.S.
PROFESSOR J. ARTHUR THOMSON, LL.D.
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DR. A. C. SEWARD, F.R.S.
SIR MICHAEL E. SADLER, K.C.S.I.

EDITED BY HIS DAUGHTER,
THE HON. MRS. ADRIAN GRANT DUFF

PRINTED IN GREAT BRITAIN

SIR JOHN LUBBOCK

From a Drawing by George Richmond, R.A., 1867

(*Frontispiece*)

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PREFACE

THIS book is not a biography of Lord Avebury. It contains an appreciation of his life's work by those eminently qualified to judge of it in its various aspects, and it aims at giving an impression of his character and personality.

The first chapter, on his childhood, is written at some length, as in his case particularly the child already shows the main characteristics of the man; and in the hope that some account of the system of education which his mother found so successful may prove a help to other parents.

It will be seen that the main thread running all through the many and extraordinarily varied branches of his work was, not merely his ardent wish to know and understand all that man may discover, but also the profound belief, which he shared with all the great Victorians, that knowledge (especially of science) would make men good and happy. One of his favourite quotations was Victor Hugo's saying, that "if you open a school you close a prison." It also pleased him to answer Pope's aphorism, that "a little learning is a dangerous thing," by quoting that it was the littleness and not the learning that was dangerous.

He found in the study of science a relaxation from other work, and a solace when worried or distressed; and from the microscope and telescope he gained an inspiration which made life for him, not only an exciting adventure, but a great inheritance of abiding happiness.

Mr. de V. Payen-Payne has kindly compiled the Index; and I desire to thank all those who collaborated with me, and who have helped with their advice or criticism.

URSULA GRANT DUFF.

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I

EARLY YEARS

From his Mother's Diary

> "The child is father of the man,
> And I could wish my days to be
> Bound each to each by natural piety."
>
> *Wordsworth.*

John Lubbock was born on 30th April, 1834, at 29 Eaton Place, London. His father was Sir John William Lubbock, F.R.S., a distinguished banker, mathematician, and astronomer, author of "The Laws of Probabilities,"[1] "On the Theory of the Moon and the Perturbations of the Planets," "On the Heat of Vapours," "On Astronomical Refractions," "On Currency," etc. He also worked out a method of determining cometary orbits, and received a medal from the Royal Society for his work on tides. He was Treasurer and Vice-President of the Royal Society for ten years, and first Vice-Chancellor of London University (1837–1842).

From the earliest possible age he delighted in mathematics, and "during his first vacation from Cambridge, wishing to work thoroughly, he went to Paris, and got introduced to the French method of teaching mathematics. He soon convinced himself of their superiority, and on his return to Cambridge studied according to the French method, showing how truly he loved his subject, and how far more anxious he was to obtain true light than to shine. Consequently, he was not senior wrangler of his year, but time proved that he had chosen the better course, for Cambridge afterwards adopted the French mathematics."

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[1] Published by the Society for the Diffusion of Useful Knowledge. The second edition had in error, on the outside, the name of Professor Morgan, "who for fifteen years did all in his power to correct the mistake" (*Encyc. Brit.*). On this work were founded many systems of insurance and gambling.

"Sir J. W. Lubbock never liked business, but he attended to it with perfect regularity. For fifteen years he was never away from its routine for three consecutive days. His early mornings and his evenings were devoted to science, but not without exciting remark. In those days a man of business, or a professional man, was expected to abstain from everything useful in private life or ornamental in society. Sir J. W. Lubbock is one of an eminent band who have driven out this paltry prejudice. There is extant a letter of his (30th October, 1840) to a business associate who had remonstrated in the usual way. 'If,' he wrote, 'by rising early, and late taking rest, or if in hours which others devote to society or sports of the field, I choose to investigate questions in astronomy, or in any other science, I do not consider that any of the correspondents of the house are warranted in addressing to me any reproach. I submit these remarks to your friendly consideration.' Certainly the firm of Robarts, Lubbock & Co. has fully answered all expectations and kept up both credit and confidence. Sir John died on 21st June, 1865, leaving behind him the memory of an upright and benevolent man, utterly free from self-seeking, and devoted to high pursuits by high moral motives and strong intellectual impulses."[1]

He was a devoted husband and father, and maintained discipline over his large family by means of affection tempered by the firmness characteristic of the period. And when he knew that his end was near "he was perfectly happy, and often said he had done his work, and was quite ready to go."

John Lubbock's mother was a daughter of Colonel

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[1] From the obituary notices in the Proceedings of the Royal Society, vol. xv.

Hotham. A more gentle, saintly character seldom breathed. She had eleven children, eight sons and three daughters. Her patience and kindliness were never-failing. She recorded every detail of her children's lives in a diary which is full of religious feeling. When her "dearest little John" was born she wrote: "May I be enabled by the grace of God to educate him in such a manner that I may not have to reproach myself if he does not 'so pass through things temporal that he finally lose not the things that are eternal,' but that I may indeed train him up in the right way." As a small boy he was often irritable and peevish when not quite well, and his mother soon perceived that "fits of naughtiness in children are generally the symptoms of ill health."

In 1836 she wrote: "My dear husband and I have very different views of education to what most people have. . . . Our great wish is to *guide* a child's *will* rather than to break it entirely, or even *force* it into doing what is right. We by no means wish to see our children mere automatons, ready to act in whatever way they are urged at the moment, but we wish to give them a right principle of action, and to see them hereafter do what is good and resist what is evil, not from the fear of punishment or from the hope of reward, but because they know their duty to God and their duty to man requires it of them. . . . We think that education ought to act more in the way of calling for gratitude, etc., than by constantly striving to eradicate some evil, which perhaps we attribute wrongfully to the child, or may be the effect of some uneasiness or disease which might be soothed away, but, if irritated, may only take a firmer hold; in short, to 'overcome evil with good' is the great principle upon which we wish to educate our children. . . . John is a tender-hearted child, and is soon made conscious of being in the wrong; but an angry word or manner irritates him, as in my opinion it does most children and people."

The system worked so well that, when his sister bit him, and his mother explained that she was so young she did not know any better, he said, "Poor Sissy," and gave her a kiss. He was then less than three years old, and at six he told his mother that he had tried very hard to please God by not beating his sister when he was very angry with her.

Before he was three he did lessons with his mother every morning. "I watch and study him," she wrote, "and devoutly pray for a blessing on all I do. I am hopeful that gentle, firm kindness and *extreme cheerfulness* in one's manner towards him will quiet him. . . . If I refuse a thing they are anxious for (but which would not be good for them to have, for I never refuse if I can help it), John is *miserable*, but Mary is *angry*."

She records that by the age of three "he knows most of his letters, and I give him a little lesson in them every day; but he is soon tired, and I am very careful he should not have too much of it. . . . I am aware that I do not enforce obedience from John as much as is generally thought necessary, but in my opinion I should sacrifice in gaining it what I think of greater consequence, the confidence and affection of the child. I do not, if possible, ever let him feel that obedience is not required of him, but I frequently refrain from asking him to do a thing if I think it likely to produce a battle of any sort. I think battles ought always to be avoided if possible, and naughtinesses to be kept off if they can."

There are no actual records in the diary of any "battles," but only indications that John was apt to yell if too suddenly taken away from an occupation which he was intent upon, and that the daily business of bedtime had to be tactfully managed.

At three and a half years of age "John looked at some paper burning in the fire, and said, 'Where is that paper now, Mama? Where do burnt things go to?' . . . I asked him the other day why he was so anxious to stay with me instead of going to the nursery, to which he prettily answered: 'Because I am so very fond of you.' . . . He asked me what thunder was, so I said I believed it was not exactly known, that I did not know at any rate, so he said: 'I suppose God knows, so I will ask him when I die and live in that happy place with him.' At four he was exceedingly fond of flowers," says the diarist, "and I expect will be a botanist." There were great games of hide-and-seek every evening with "dear Papa."

Under date 1838, June 28th, the Coronation Day, an entry runs: "J. W. took John to the Royal Exchange rooms in Pall Mall to see the procession to the Abbey, but I daresay he won't remember it at all." But he did remember it, and in later life he said: "The first two things I can remember are—sitting at a window in front of some red drapery to see the Queen's coronation, and a large insect under a glass."

A few pages further his mother observes: "His great delight at present is in insects. Butterflies, caterpillars, and lady-birds are great treasures, and he watches a spider there is outside my window most anxiously."

His keen sensitiveness is shown by the following incident: "The other day I was writing some mathematics, with dear John playing in the room, and looking, I suppose, *very intent* upon the book, when my darling came up to me in the most touching way and said: 'Are you angry with me, Mama?' 'No, dear, why did you think I was angry?' 'Because I thought you looked as if you were angry with your little boy.'"

"How many a day has been damped and darkened by an angry word!" said Sir John, long afterwards, in his "Pleasures of Life."

On one occasion Lady Lubbock was reading the history of England to the children, and John exclaimed:

"If I had been alive when they cut off that poor king's head, I would have taken my longest whip and whipped them well, and then I would have given them to the police to take to the prison."

When he was nearly five years old his mother wrote: "John and Mary come to me every day at 11 till their dinner time. They read and spell, say numbers, French, and a little geography, which latter John enjoys very much. I have made some maps with coloured paper, and John knows a good many places on the map of the world and of Europe. He can say all the Commandments and the Lord's Prayer." Soon after this: "Papa gave them a globe which is nailed down in the drawing-room, and John traces the countries on silver paper and cuts them out." One of his greatest wishes was to understand everything; for example, "on 3rd March, 1839, my dear John went with his papa and me to church for the first time. . . . After the hymn he whispered: 'I don't quite understand what that hymn was about; will you tell me when I get home?'"

Soon the cares of an increasing family necessitated the help of a governess; but the search for exactly the right kind of person was accompanied by many changes, with intervals during which the mother again delightedly "took possession of the schoolroom." Both parents were most anxious that their children should speak French easily and well, and at last an entirely delightful and placid Frenchwoman was installed, and she remained for years.

Early in 1840, we read, "John said to his grandpapa: 'I hope you will be grandpapa to my little children when I am a great man.' Sir John: 'Probably, my dear little boy, I shall not live to see your little children.' John: 'Oh dear, I shall be very sorry for that, you are so very kind to me; however, we shall meet again in heaven.'" Which shows how early he formed the resolution to look on the bright side! Not long afterwards the diary records his remark: "When I am a man I mean to travel all over the world, and find out everything, every plant and animal, and what lives at the bottom of the sea; and I mean to go to China."

When John was just six his mother read to the children from Luke ii, and she writes: "When they heard of the shepherds going to Bethlehem, John said: 'But, Mama, who took care of the sheep when they were gone?' One day he said: 'I shall be glad when the end of the world comes, Mama.' 'Why, my love?' she asked. 'Because,' he replied, 'then the poor animals won't be ill-used any more.'" Hearing of some children whose mother had died, he exclaimed: "Oh, I am quite sure if you were to die, I should die too; I could not live without you, Mama!" One day he whispered in his mother's ear: "It's very odd, Mama, but when I am praised I feel as if I could not help crying"; and she adds: "This shows great sensitiveness, which, though very delightful in a boy, had better not be encouraged, I believe, for his own happiness: he is not well now, and I daresay that adds to it. . . . The other day we were reading the Psalms, and we came to—'The foolish shall not stand in thy sight.' I explained to them that 'foolish' meant wicked, and John said: 'I am very glad you told us that, Mama, for I felt sorry for the foolish, because I thought they could not help being foolish.'"

1841. Their mother "read them the story of little Harry in Mrs. Sherwood's 'Fairchild Family' who would not say his lesson, so his papa left him, and no one spoke or took any notice of him, and he suddenly sees his papa walking in the garden. John said: 'I would have run after Papa and begun saying my lesson very perfect.' Mary said: 'I would have said, Pray, dear Papa, forgive me.' But dear little Di said: 'I would have knelt down and prayed God to soften Papa's heart towards me.' I must say they are all very sweetly disposed and most anxious to do right."

Yet it was only John who thought it necessary to make amends by doing his work properly!

Under 1842 we read: "I said: 'You are to have a holiday, as it is Papa's birthday.' John: 'Well, Mama, I am surprised to hear that, because I should have thought we ought to do everything to please Papa on his birthday, and surely he would rather we were getting on with our lessons.' Soon after this he heard his mother explaining to his little sister what her 'station in life' meant, and how she must be good and affectionate, and he exclaimed: 'Oh, pray, Mama, don't tell her to be more affectionate! She's affectionate enough in all conscience, poor little thing. She's a good little girl, but she bothers us with her affection, and sometimes clings round my neck when I want to run a race.'"

Another time, "We were talking about resisting the Devil, and what that means, and John said: 'Mama, do you think it is right in us to hate the Devil? I don't; I thought we ought to hate no one.' I said: 'Very true, dear, but the Devil is the personification of sin, and we must hate sin.' John: 'True, Mama, but the Devil was once an angel, so I think we ought to wish he may some day grow good again, instead of hating him.' The excessive beauty and originality of this remark struck me more than anything I have heard said by a child, and I could not help feeling, 'Of such is the kingdom of heaven.'"[1]

John went to school soon after he was nine years old, the date having been postponed through whooping-cough. He had previously had scarlet fever, and from both ailments he took longer than is usual to recover. All through boyhood he was subject to feverish attacks. His mother and father took him down by train to Mr. Waring's school at Abington, and stayed over the Sunday to make sure that their boy was happy and comfortable. His room is described as "a nice large airy room with a little white bed, no curtains or carpet, but a good fire"—which sounds much less austere than the schools of that date are generally reputed to have been.

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[1] Mr. Horace Hutchinson remarks in his "Life of Lord Avebury":—"One who knew Lord Avebury very intimately was especially delighted with this observation, and said: 'Why, it is what he has been doing all his life, trying to convert devils.'"

Mr. Waring treated the parents with much hospitality, and they were able to leave their boy in "great satisfaction"; though his mother notes that "I miss my dear boy far more than I expected with so many." They soon had two very satisfactory letters from Mr. Waring, and John himself wrote: "I am a favourite with most of the boys because I do not care about being laughed 'at.'"

A few months later we read: "Monday, July 31st, 1843. Dearest John came home. We were all at the door ready to receive him, and we walked this evening to the farm all together, and felt very happy to have him home again. . . . I do not find dear John altered in character or in tastes, I am happy to say, but a little roughened by school. He is, however, very dear and affectionate, and seems very fond of Mr. Waring."

On 6th August, 1843, John wrote a sermon on the text, "Oh praise the Lord, all ye heathen; praise Him, all ye nations, for His merciful kindness is ever more and more towards us." In it he points out that "we do not deserve the gifts God bestows upon us"; for already, as always, John felt that, in spite of many sorrows, life is "a great gift and privilege, a glorious inheritance." The nine-year-old writer's sermon deplores that "some people are more fond of worldly goods than spiritual pleasures."

His mother "grieved over parting with him" every time he went back to school, but proudly reflected that he was "so *talented*, so affectionate, so *entirely original* . . . entering into everything so delightfully, quite beyond his years. Then again his love of reading and his very retentive memory give him a great deal of information, and his taste for natural history makes him an acute observer."

He was fond of reading poetry and trying to write it. His mother hoped he might become a poet as well as a botanist. One of his best efforts in verse is almost an epitome of his philosophy:—

Of all the powers that men possess,
Of all the joys we're given here,
The greatest is the power to bless
And wipe away the gushing tear.

Nor is there any one too weak
To aid a brother in distress,
For, even if we can but speak,
We need not leave him comfortless.

His early tendency to melancholy (which, however, he so successfully outgrew) and the religious atmosphere in which he was brought up are illustrated by the following verses, written in boyhood:—

Oh why should the ivy on high
  In the elm tree luxuriantly grow,
While the poor little bramble close by
  Is confined to the bushes below?

And why should the cowslip have bloomed
  In the pleasantest part of the year,
While the lowlier snowdrop is doomed
  When winter returns to appear?

And why should some people, I wonder,
  Live here without sorrow or pain,
When trouble is rending asunder
  Each fibre of my poor brain?

Yet those whom we often conceive
  To live here exempted from care
Could tell us if we would believe
  That they too have sorrows to bear.

Then, after describing the compensations of the bramble and snowdrop, etc., he ends up:—

To God we are all of us dear,
  And our sorrows are proofs of His love,
For those who are suffering here
  Are preparing for glories above.

At the age of eleven and a half John went to Eton and was placed in the "remove"—that is, as high as a new boy could be placed. But, to use his own words:—

> This was rather unfortunate for me, as I was in the same division as boys four or five years older than I was, and with whom I had no chance of competing. . . . At that time the whole education consisted of Latin and Greek, with one lesson a week in geography, confined mainly to Italy, Greece, and Asia Minor. . . . Neither arithmetic, modern languages, science, nor drawing were regarded as essential portions of education. . . . Arithmetic, French, and German had, indeed, just been started, but they were treated as extras, like fencing and dancing. They were only taken if parents especially wished it, and then in play time. My father did not think they were well taught, and the result was that I never did a sum, or had a lesson in any modern language, the whole time I was at Eton. . . . So far from giving a classical education, the result is to give nine boys out of ten a profound dislike of classical literature. . . . On one occasion we were given the Bee as a subject for a theme. I took some pains with it, and my tutor sent for me and asked me confidentially whether it was all true. From what he said I inferred that they rather suspected I was quizzing them, and doubted whether to commend or to flog me. Happily for me, they accepted my assurances.

His father was always trying to get the authorities to include science in the curriculum, and at last John's tutor wrote and said that he had been able to introduce "some science" into the holiday task. Sir John, highly pleased, sent for the "task," but the only reference to science that he was able to find was the statement, among sentences for translation into Latin, that "the sun and the moon are planets"! Hence, as neither the curriculum nor the climate of Eton suited the boy, his father removed him at the early age of fourteen and a half, and in the following year found him a place in the family Bank; so that we must now consider him grown up.

I am sure that all those who knew Lord Avebury in after years will find no difficulty in recognising him in the sensitive, clever, eager and affectionate boy portrayed by his mother, the only differences being that his physical delicacy had grown into the strength of manhood, and the irritability of nerve and temper had disappeared and given place to a serenity of mind and disposition which I have never seen surpassed. How much of this was due to his mother's love, patience, and unceasing care and watchfulness, those who have read her Diary cannot fail to realise.

II

LATER YEARS

By the EDITOR

JOHN LUBBOCK's real education began when he left school. He went into the family Bank in 1849, at the age of fifteen. Soon afterwards his father's two partners died. He and his father carried on the business, and could never both be away together. At first he felt very much at sea, and found the City very lonely; but this early initiation doubtless developed in him a sort of instinct for business. During these early years he had a good many holidays, in the course of which he continued his own education and learned mathematics with his father. This subject, like all other branches of science, he found interesting, though he had no special aptitude for it. His father's mathematical genius was, in some respects, a disadvantage, as he was unable to see the difficulties which its problems presented to others. He would often say, in despair: "Well, if Newton does not make it clear to you, I am afraid I cannot! We must go on."

In other directions John made good progress, reading seven or eight hours a day, and devouring all sorts of books, but especially those on biology and geology. He made himself a time-table for the days on which he did not go to the City, mapping out most of the day from 6.30 a.m. to 12 p.m.! The subjects on the time-table include mathematics (which he prepared and took to his father before breakfast), natural history (reading and work with the microscope), poetry, political economy, history, sermons (these he found he could not read later than 10 p.m. without falling asleep!), and, finally, German, which kept him awake till midnight.

He thus early cultivated his naturally great powers of concentration. Not only was he able to turn promptly from one subject to another—a change which he found both helpful and necessary, in order to give the different parts of his brain exercise or rest—but he could also suffer interruption with perfect equanimity, and, after answering a question or dealing with the urgent problem thrust upon him, he could go smoothly onwards again with his work. No one ever heard him complain that the current of his thoughts had been broken.

It seems absurd nowadays to think of a boy of fourteen and a half years being regarded as grown up, but it is a fact that he began early to lead a man's life, being in all respects exceptionally mature. He continued, of course, to develop, and his interests became wider and deeper. This growth was continuous up to the very end of his life; but he unfolded according to the first intimations of type, and his outlook and point of view showed remarkable consistency. In religion, for instance, being one of the first of Darwin's followers, he had to abandon orthodoxy and dogma to a great extent, but the reverent attitude of his mind—his gratitude for "the great gift of life"—remained the same. All his life, with the exception of one short interval of insistent scepticism, he went to church. Every day he read a chapter of the Bible, and said his prayers night and morning, thus paying tribute to the Great Mystery, and keeping his mind in tune with its harmony. He said that no church service could be framed to suit everybody, but that each one of us could choose the parts we found most helpful, and leave the rest. Towards the end of his life he wrote, in "Peace and Happiness":—

> Must it not be a satisfaction to meet one's fellow-countrymen in reverent recognition of that mystery and in gratitude for the great gift of life, without allowing ourselves to be separated by metaphysical differences? If we differ, let us remember, as Milton said, "Error is but truth in the making." . . . I hope and believe with Ruskin that "the charities of more and more widely extended peace are preparing the way for a Church which shall depend neither on ignorance for its continuance, nor on controversy for its progress, but shall reign at once in light and love."

But, pending the institution of this ideal, he attended the parish church at Down, where, on one occasion, he and Darwin being present, the Vicar preached a violent sermon against "the infidel and the naturalist in our midst." There being no doubt as to the identity of the one, young Lubbock proudly hoped that he might share the partnership by representing the other.

It was very largely from Darwin that Lubbock learned love and respect for science and truth, and an admirable patience and genuine modesty—the personal modesty of the true man of science who, with Newton, contemplates the vast unexplored ocean of knowledge.

In 1850, at the age of sixteen, he gave his first lecture. It was given at Down, on the Wireworm, and was well attended by the villagers. He now began to realise how right his father had been in saying that Darwin's coming to live at Down was an immense advantage to him. It was Darwin who induced his father to give John a microscope, and the latter keenly enjoyed his walks and talks with the famous naturalist. At the Darwin-Wallace Celebration, in 1908, he remarked of Darwin:—

> I first heard his name in 1842, when I was just eight years old. My father returned one evening from the City, and said he had a great piece of good

> news for me. He excited my hopes and curiosity, and at last announced that Mr. Darwin was coming to live at Down. I confess I was disappointed. I thought at least he was going to give me a pony! But my father was right. I little realised what it meant to me, nor how it would alter my whole life.

Lubbock's first scientific work was on some of Darwin's collections, and appeared in the *Natural History Magazine* for January, 1853. He did all the plates for these papers himself, and also many of the illustrations for Darwin's great work on barnacles.

In 1849 he had been elected a member of the Royal Institution, and in 1853 attended his first meeting of the British Association. Forty-eight years later the fiftieth meeting of the Association was held at York, under Sir John Lubbock's presidency. In 1854 he was introduced to Sir Charles Lyell and Sir Joseph Hooker, and in 1855 to Kingsley, Prestwich, and Sir John Evans, and joined the Geological Society. In 1856 he met George Busk, Huxley, and Tyndall, and in the following year was elected a member of the Royal Society. He writes: "It would be impossible for me to express how much of my real education I owe to the advice, the sympathy, and the example of these kind friends." The encouragement which they so unstintingly gave their young colleague was one of the pleasantest features of this friendship. For instance, Darwin wrote to him in 1857:—

> Dear Lubbock,—At the Philosophical Club last Thursday I overheard Dr. Sharpey speaking to Huxley in such high and warm praise of your paper, and Huxley answering in the same tone, that it did me good to hear it.

They seldom failed to write and congratulate him when he found a fossil, or discovered a hitherto unknown insect or plant. The many letters that he received show the reputation he had so early acquired, not only for careful and industrious work, but for much that was entirely original. It is wonderful how soon the younger man grew, from being a pupil or disciple, into the position, at least in Darwin's eyes, of an equal. From the moment that "The Origin of Species" appeared Lubbock was not only a staunch supporter, but one who contributed his own weight of evidence to the subject. Early in 1860 Darwin wrote to him:—

> If ever you arrive at any definite conclusion, either wholly or partially for, or against, Pangenesis, I should very much like to hear; for I settled some time ago that I should think more of Huxley's and your opinion, from the course of your studies and the clearness of your mind, than that of any other man in England.

At the British Association meeting of that year, when "The Origin of Species," which had been published at the end of 1859, was fully discussed by all parties, and violently attacked by the Church, the laity, and even most men of science, Lubbock read an important paper on the embryological evidence for evolution.[1]

At an earlier age Lubbock had joined the Kent Artillery Militia, and performed all the duties with characteristic thoroughness. He played cricket, hunted with the beagles, went to dances and parties, and, in fact, "enjoyed life" in many ways. Whatever he did he took pains to do as well as possible. For example, when, later on, he was asked to play cricket for the House of Commons, "in order to prepare himself, he used to get Wells, the Bromley professional, to bowl to him for some weeks regularly in the early morning before he went up to

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[1] The theory of evolution had so few adherents that Huxley wrote: "I do not call to mind among the biologists more than Asa Gray, who fought the battle so splendidly in the United States, Hooker, who was no less vigorous here, Sir John Lubbock, and myself. Wallace was far away in the Malay Archipelago."

London on business, the result being that he scored well against Harrow and I Zingari."[1]

When, in 1865, he first stood for Parliament (West Kent), and was handsomely defeated, it is said that he lost many votes owing to the publication of "Prehistoric Times." He had been urged to postpone the issue of the book until after the election; but this device he, of course, regarded as dishonourable. Previously he had been asked to stand for the City, where he would have had a very good chance of success, but his father had refused his permission. It never seems to have occurred to the son to question his father's decisions, or even to enquire into their reasons, although he was over thirty years of age when his father died.[2] He then at once assumed towards his younger brothers an almost fatherly attitude, which they accepted quite naturally from one who understood so well the duties, rather than the privileges, of the head of the family.

At the time of the election just referred to Darwin wrote to congratulate him on the publication of "Prehistoric Times." Part of this letter is quoted by Sir Arthur Keith on pp. 81–2. It closes with these words:—

> It has quite delighted me, for now the public will see what kind of man you are, which I am proud to think I discovered a dozen years ago. I do sincerely wish you all success in your election and in politics; but, after reading this last chapter, you must let me say: "Oh dear! Oh dear! Oh dear!" Yours affectionately,
>
> CHARLES DARWIN.

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[1] "Annals of the West Kent Cricket Club," by Philip Norman, who adds a note that "Joseph Wells, who kept the china shop and was professional to the West Kent Cricket Club, was father of H. G. Wells."

[2] There is a rather delightful description by an eye-witness of how Sir J. W. Lubbock used to drive with his sons to the City every morning with four horses and two postilions. The son whose turn it was to sit by his father's side invariably behaved with the utmost decorum, but the others in the brake behind, invisible to the eye of authority, performed every kind of silent antic, to the great entertainment of those they passed on the way.

We can scarcely believe, therefore, that Darwin was really very sorry that his young friend had to wait another five years before entering Parliament. It must not, however, be thought that Darwin felt anything but respect for the statesmen who direct our destinies. Indeed, there is a charming story of how, on one occasion, Sir John took Mr. Gladstone to see him. When Gladstone, who had never ceased talking, went away, Darwin, who had never got a word in edgeways, shaded his eyes with his hand, and, gazing after the retreating figure of Gladstone, murmured: "To think of such a great man coming to see me!" Gladstone, on the other hand, expressed himself as disappointed with Darwin's conversational powers.

In the following chapters will be found an account of John Lubbock's work, his books, and many of his various activities. Here it is only intended to record a few of the incidents and traits which afford an insight into his character, and give some sort of picture of his personality.

I think that one of the things that struck people most about him was his unfailing courtesy to old and young, great and small. This quality sprang spontaneously from his inborn gentleness and kindliness of heart, just as the main reason why he was so patient with wrongdoers was that he generally felt sorry for them. The only weapon that he ever used was a certain coldness of manner, which, however, was so very effective that it never had to be employed for long. He was often chosen by his friends or colleagues to deal with a recalcitrant member, or one whose manners had caused offence, and he was usually successful, for he would say: "You are always so nice to me that, if only you would treat so-and-so in the same way, I am quite sure that all would go well." And afterwards it very often did.

Although he quite outgrew the delicacy of his boyhood, and attained remarkable vigour (frequently, for instance, after an all-night sitting in the House of Commons, not considering it worth while to go to bed at all), he suffered much all his life from attacks of gout, which were often very severe. He bore them with great patience, and never gave way to the irritability which is proverbially recognised as one of the usual symptoms. Not seldom, these attacks cancelled pleasant engagements; but, fortunately, Lubbock counted the happiness of anticipation among the main pleasures of life which no subsequent disappointment could destroy, and he would plan with delight some journey or expedition which perhaps he suspected would never be realised. Yet his sensitive temperament must often have been a prey to bitter vexation which it needed all his philosophy to surmount. For instance, when the Early Closing Bill was thrown out on the very verge of passing into law, though he had felt sure of carrying it through, I shall never forget how grey his face looked as he paced up and down his library (a most unusual thing for him to do), until he had mastered his feelings sufficiently to settle down to work. After every such temporary defeat he rose up with even greater determination than before. When at last the Early Closing Bill was passed in 1903, he wrote in his diary: "Got my Early Closing Bill through the House of Lords after thirty years' work—very thankful!" He always kept a diary for the purpose of reference, but all the entries are in this brief style.

Sir E. Ray Lankester, in a short appreciation which he sent to Mr. Hutchinson, pays tribute to another aspect of Lubbock's character, saying: "In early days he was a great feature at the Red Lion's dinners at the British Association, and used to keep the whole thing alive by his wonderfully humorous speeches." His humour was never cynical, or remotely unkind, and thus it now and then escaped notice. He enjoyed witty and funny stories untainted by malice, and no one who saw it will ever forget the genial twinkle of his eye. All through his writings the reader will find this trait of quiet humour, of which a few specimens will perhaps best illustrate the nature. Speaking of education in "Peace and Happiness," he says: "We cannot hope in these degenerate days to spring into life perfect, like Pallas Athene." And again: "Alexander the Great is said to have always kept a copy of the Iliad under his pillow, but in another sense whole generations of schoolboys have also slept over Homer." Or, when addressing the students of St. Andrews University as their Rector in 1908, he said: "I do not forget the sad fate of the young New Zealand chief, one of the earliest Maori converts to Christianity, whom his countrymen, after some months of forbearance, killed and ate because he gave them so much good advice."

He was a delightful and popular lecturer on a wide variety of subjects, and especially enjoyed speaking at the Working Men's College, of which he was Principal for fifteen years (1883–1898). During these years he lectured on "The Habits of Ants," "Savages," "The Shapes of Leaves and Cotyledons," "Reminiscences, Political and Personal," "The Senses and Instincts of Animals," "The Scenery of Switzerland," "Education and Books," and "The Pleasures of Life"; and he took the chair at, or attended, the more important meetings at the College. In January, 1886, at the Distribution of Certificates, he delivered an address to the students on "The Hundred Best Books."[1] His voice was not very strong, but he learned to manage it to the best advantage. His sense of humour and gift for handling weighty subjects not heavily, and for relieving the fatigue of concentration on serious things by an occasional hearty laugh, made it a delight to listen to him. The reasons that attract audiences are sometimes unexpected, and on one occasion he tells us that an unusually large assembly had gathered at Glasgow, the Baillie having advised every one to go because "the last time Sir John was there he drove a pin into his leg and made the Lord Provost draw it out!"

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[1] See Chapter x, p. 231.

In 1863 he gave his first Friday-evening lecture at the Royal Institution. It was on the Lake Habitations of Switzerland, which he visited that summer with Tyndall and Huxley; and it was such a success that Tyndall wrote an account of it in glowing terms to Mrs. Lubbock, with this charming close:—

> As for me, who, it must not be forgotten, stirred up his mind to the performance, I feel like a little glass bead silvered within and set in the sunshine, complacently radiating from a little reflected sun pictured on my own surface. With this very pretty figure I leave you to muse pleasantly, as of course every wife does, on the solid triumph achieved by my friend your husband.
>
> Believe me,
> Always Yours,
> JOHN TYNDALL.

And again, on the occasion of a lecture to the British Association in 1874, Tyndall (then President) wrote:—

> I think you will be as pleased to hear it from me as from anybody else (there is presumption!) that John's lecture was beautiful, and gave the greatest delight to a large and brilliant assembly.

One of Lubbock's chief pleasures was travelling, but he pursued it with a definite objective, and never aimlessly; as, for instance, to France in 1860 with Prestwich, Galton, and Busk, to investigate the gravels of the Somme Valley with their stone implements; and to Denmark in 1863 to visit the Scandinavian shell mounds, etc. He had gone abroad for the first time in 1854 to Paris, where, as a young man of twenty, he made the acquaintance of some of the leading French men of science, who, with their customary hospitality, were happy to show him their most recent discoveries.

His interests were so many and varied, and withal so keen, that he obviously needed considerable self-control in eliminating those he had no leisure for, or such as might interfere with his duties; and indeed we have more than one glimpse of the fact that he did deliberately give up sport, and allowed outdoor games, which he thoroughly enjoyed, to occupy only such time as made them healthful. In a letter to his son-in-law, Sydney Buxton (now Earl Buxton), he says: "Hunting, shooting and fishing interest me only too much. Sometimes I despise myself, and at others hope I shall be rewarded for my virtue in giving them up!" (5th November, 1902). This was evidently written in a whimsical mood, and the following quotation from "The Pleasures of Life" gives his mature opinion on "Sport":—

> Our countrymen derive great pleasure from the animal kingdom, in hunting, shooting, and fishing, thus obtaining fresh air and exercise, and being led into much varied and beautiful scenery. Still, it will probably ere long be recognised that, even from a purely selfish point of view, killing animals is not the way to get the greatest enjoyment from them. How much more interesting would every walk in the country be if man would but treat other animals with kindness, so that they might approach us without fear, and we might have the constant pleasure of watching their winning ways.

No man ever got a greater amount of solid work into his days, or wasted fewer moments. He wore elastic-sided boots—explaining to his family (when they objected) that one could learn a language in the time people take to button or lace up their boots. He always had a book in his pocket for the odd bits of time, and once he was seen correcting the proofs of a book in between the acts of a play. Few men ever sat on so large a number of committees and commissions, or belonged to so many societies, for many of which he acted as President. His family said that he had an "Annual Meeting" every day! This incessant occupation gave a sharpened zest to his holidays and trips abroad, and enhanced his enjoyment of the risks of mountaineering. On one occasion he and Professor Tyndall, taking advantage of a strong wind, went up Vesuvius during an eruption. Lubbock insisted upon going a little way over the edge of the crater so as to look in, while Tyndall insisted upon roping him and hanging on to the other end of the rope. This was in 1868, and in the same year he went to Switzerland with the Headmasters of Eton and Winchester; for, having lately been appointed one of the Public School Commissioners, it was an opportunity not to be missed to discuss education.

In 1869 the Metaphysical Society was started, and, as the membership comprised the most eminent men in all branches of knowledge—among them Huxley, Tyndall, Gladstone, the Duke of Argyll, Sir M. E Grant Duff, John Morley, Ruskin, Martineau, Tennyson, Browning, R. H. Hutton, W. Bagehot, Frederic Harrison, Leslie Stephen, W. R. Greg, Mark Pattison, Cardinal Manning, Dean Stanley, and three bishops—it was no small compliment, both to his services in many fields and to his qualities of chairmanship, that he should have been elected the first President He was also (at the suggestion of Huxley) the first President of the Anthropological Institute, and first President of the Bankers' Institute. He belonged to most of the scientific societies, and, at various times, was President of the Selborne, Entomological, Ethnological, Linnean, Ray, Statistical, and African Societies,—the Society of Antiquaries, the Royal Microscopical, and Royal Historical Societies; and he was Vice-President of the Royal Society. He was also Honorary Member of many foreign scientific societies, and was first President of the International Institute of Sociology, President of the International Association of Prehistoric Archæology, and President of the International Library Association. He believed it to be one of the greatest of the many great missions of science to draw the nations of the earth into a closer conscious brotherhood, and so eventually to eliminate war. Towards the end of his life he wrote: "It is impossible to read the history of the Russo-Japanese War, or for that matter of any war, without a feeling of intense horror and shame."

In 1872 he was unanimously elected Vice-Chancellor of London University, his objection (that he was unfitted for the post by not having been to a University himself) being overruled; and he remained Vice-Chancellor until 1880, when he became M.P. for the University.

In the same year (1872) he went for the first time down the Danube to Constantinople and Asia Minor, travelling with the Gregs and Grant Duffs. Sir Mountstuart Grant Duff was one of his life-long and most intimate friends, and many were the expeditions, botanical and otherwise, both at home and abroad, which they made together.[1] At this time Lubbock was engaged in an interesting and enthusiastic correspondence with Schliemann, the discoverer of the site of Troy. He was fond of telling how, while scholars held endless discussions as to the exact site, and even the existence of Troy,—each supporting his theory by quotations from Homer, etc., the practical-minded Schliemann, after careful study, went to the spot and dug, until he disclosed the stones and foundations of Troy itself. Schliemann wrote off in great excitement to Sir John: "Your Excellency,—Hurrah the Skaengate, which consists of two separate gates . . . hurrah the copper bolts with which they were shut! Hurrah the house of Priamos," etc., etc.

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[1] In 1893 Grant Duff asked Lubbock to speak at the Geographical Society in favour of the proposal that women should be eligible as Fellows. He gladly did so, but his persuasive powers were less successful than usual, and it was not till many years later that women were admitted.

Sir John was President of the British Association in 1881 (its Jubilee year), and his address, afterwards published under the title of "Fifty Years of Science," was much admired, especially by his friend Darwin, who wrote: "This address must have cost you much labour, and I congratulate you on its virtual completion. How on earth you find time is a mystery to me." *Punch* expressed much the same idea of his amazing capacity for work in a cartoon representing Sir John as a bumble bee, with the legend beneath:—

How doth the Banking Busy Bee
Improve the shining hours?
By studying on Bank Holidays
Strange insects and wild flowers.

When, in 1882, Charles Darwin died, Lubbock lost his oldest and best friend, one who had been a continual inspiration to him for thirty years, and of whom he said: "A talk with him was as good as sea air." And in 1908, in the course of an address at the Darwin-Wallace celebration, Lubbock declared: "I am one of the thousands whom Darwin has inspired by his writings, and of the few still living who have had the inestimable privilege of his friendship. Often and often, when feeling overworked or discouraged, an hour with him has proved a wonderful cordial and brushed away the cobwebs of the imagination like a breath of sea air."

Lubbock's ardent wish to alleviate suffering and to make people happy was shown not only in his political efforts and in his books, but by the schemes he put forth, or aided, in cases of special suffering. For example, in 1871 he, Cardinal Manning, Huxley, and Knowles (of the *Nineteenth*

Century) formed themselves into a committee for sending supplies over to Paris the moment the siege was raised. And again, towards the end of his life, when he was feeling weak and easily tired, he went to see the Lord Mayor of London daily to try to devise a scheme for providing the very poor with cheap coal in case of a big strike. In between these instances there were countless "nameless unremembered acts of kindness and of love," both public and private, and many were the labour disputes in which he was called upon to arbitrate.[1]

One of the most astonishing of his characteristics was the habit of answering every letter; and, although calls for money were far too numerous to be satisfied, he never omitted, when unable to comply, to send a short note of regret. Once an eccentric individual wrote and asked for an old pen nib. He thought the request so modest that he sent a copy of "The Pleasures of Life" instead. The correspondent expressed much disappointment, and reaffirmed that, though glad to have "The Pleasures of Life," what he wanted was an old pen nib for his collection. Thereupon Sir John picked an old nib out of the waste-paper basket and handing it to his secretary with an amused twinkle in his eye, said: "I suppose he may as well have what he wants, poor fellow: at any rate, there is no harm in it."

His was an extraordinarily simple and unself-conscious nature. He enjoyed, as any unsophisticated human being enjoys, all tributes to the value of his work and all expressions of affection for himself, and his honesty would have scorned to pretend that he was not gratified.

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[1] As Mr. H. G. Hutchinson says in his "Life of Lord Avebury," Vol. I, p. 311: "By virtue of Sir John's efforts in composing the Dock Strike, the Coal and Gas Companies' difficulties, and other troubles between Labour and Capital, his good influences as a pacificator, in these conditions, became widely recognised and were much sought,"—as for instance by the omnibus proprietors and their employés. He was invited "as a prominent citizen possessing the confidence of the community."

In this spirit he accepted his peerage, and all the other honours that were conferred upon him both at home and abroad. No doubt it was largely due to this attitude of mind that he got on so well with people of other nationalities who express their feelings with less reserve than we do. Few Englishmen could have enjoyed, as unaffectedly as he did, the charming reply of Monsieur Loubet to his address on the visit of the President of the French Republic to London (1903), when, as he records, "he held my hand between both of his all the time."

Another of his pleasures was to invite the villagers of the neighbourhood round High Elms to what he called "Parish Parties," or to welcome the Selborne Society, Teachers' Association, Bank Clerks, etc., to give the visitors tea and coffee, and to show them his collections of many kinds which were arranged in small groups each in charge of some member of the family or household who had previously been instructed how to instruct. Around the walls were to be seen his collection of prehistoric flint implements, and above them the modern savage implements with which they are compared in his books on "The Origin of Civilisation" and "Prehistoric Times." In the summer these parties took place in the afternoon, and the guests were shown round the garden and ponds. In the winter they were held in the evening. At all times the grounds were open on application to all kinds of visiting parties; children's school treats, workhouse outings, etc., were a constant feature. Lord Avebury especially delighted in showing the exciting revelations of the microscope to children, in whom he took the keenest interest and delight. He never laughed at them, but always treated them with courtesy and consideration.[1] When asked what he considered to be the most suitable domestic pet, he answered: "For grown-up people I think the best pets are children." He had a large number of beautiful slides, to which he added from time to time both by purchase and by the work of his own hands; and when an unusually successful slide had been produced everybody in the house was called to come and look at it—housemaids had to leave their dusting, cooks their cooking, and the boot-boy had to abandon the boots. He loved to share everything he had, and hoped to arouse in others a pleasure and interest equal to his own. Even during the last two years, when his health was failing, these activities continued to a certain extent. They implied an increasing effort, but an effort that he thought worth while, though, on the last few occasions, his diary records that he afterwards felt very tired.

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[1] For instance, he gave a little boy aged seven years a copy of White's "Natural History of Selborne," with the inscription: "Adrian Grant Duff, from his sincere friend, John Lubbock."

He always much enjoyed entertaining his friends, whether in London at breakfast or dinner-parties, or at High Elms and Kingsgate Castle from Saturday to Monday; when he brought together interesting people of all kinds and nationalities. Unless for some special occasion, such as a Congress, he avoided making his parties merely political or scientific; but, on the contrary, devised all sorts of blends, which were much more amusing. He was himself a social asset in any group of people. He was a member of "the Club," the Reform Club, of "Grillions," and of the "Breakfast Club," etc. Of Clubs in the usual sense, he used only the Athenæum.

In 1864 he had been welcomed, as the youngest of the nine elected members, into the X Club; founded in that year at the suggestion of Huxley for the purpose of enabling a group of scientific friends to meet regularly. The members consisted of George Busk, Edward Frankland, T. A. Hirst, Joseph Hooker, Herbert Spencer, John Tyndall, and W. Spottiswoode, in addition to Huxley and Lubbock. They dined at 6 p.m. on the first Thursday of every month before the meeting of the

Royal Society—of which all were members, except Herbert Spencer. Small as the Club was, its members played a considerable part in the history of science. Five of them received the Royal Medal; three the Copley; one the Romford; six were Presidents of the British Association; three associates of the Institute of France, and from amongst them the Royal Society chose a Secretary, a Foreign Secretary, and three successive Presidents. "The X Club is probably unique in the smallness of its numbers, the intellectual eminence of its members, and the length of its unchanged existence. . . . The last meeting was held in March 1893" ("Life and Letters of T. H. Huxley," by his son, Leonard Huxley). In 1878 he was appointed a trustee of the British Museum. It was in this capacity that in 1905 he received, on his colleagues' behalf, Mr. Carnegie's gift of the great cast of the Diplodocus. In his words of thanks at this ceremony, Lord Avebury mentioned that this enormous creature had more nervous matter in its hips than in its head, and that its actual brain was no larger than a walnut. He generally took the precaution of giving a summary of his remarks to the newspaper reporters present, in order to avoid painful mistakes. But on this occasion he must unfortunately have omitted to do so, for one newspaper reported him to have said that the brain of the Diplodocus was no larger than a woman's. He therefore received a most indignant letter from a suffragette. We may, however, be quite sure that, although much amused, he wrote at once gravely and courteously to explain the error.

Lubbock was an ardent lover of peace, hating war and quarrels of all kinds with all the hatred of which he was capable. He did his utmost for the cause of peace all his life long, and, while never denying that there were occasions on which war was inevitable (notably during the South African War he was much distressed by the attitude of those who were called "pro-Boers," though it made no difference in his affection for old friends like the Courtneys), he made it one of the main objects of his life to help every cause that tended to lessen these occasions, and fully believed in the power of humanity eventually to eliminate them altogether. No movement for the betterment of the human race ever left him indifferent, whether to be achieved politically by means of such methods as proportional representation; socially by his many Bills for shortening the hours of labour; by the encouragement of medical research; or, above all, by education. When the first International Moral Education Congress was held in London, in 1908, it had no more zealous supporter. At a reception which he and Lady Avebury gave its delegates from all parts of the world he said: "Our ideal is to 'give peace in our time,' and that not only between nations, but in families; and it is because it will, as we believe, contribute so effectually to these two great objects that we are supporting the movement to promote moral instruction as an essential part of our educational system."

In 1908 he was elected Rector of St. Andrews University, and his address on that occasion is one of the most delightful and inspiring he ever gave—full of humour, kindliness, and the soundest advice—the accumulated wisdom of a long and well-spent life.

It has been thought unnecessary, in a book of this kind, to mention individually any of the members of Lord Avebury's family. Suffice it to record that in all personal relationships, and especially as husband and father, he was one of the kindest, most loving and understanding men that ever lived. It was especially delightful to see him and Lady Avebury together. Their mutual devotion and happiness in each other's companionship—her pride in him, his keen enjoyment of her vivacity, their absolute understanding of one another—made an atmosphere which undoubtedly was of enormous assistance and encouragement to him in his arduous life. With regard to his children, the most severe reproof that they ever received was to be told that it grieved him when they did not do themselves justice. And he was repaid by deep devotion on their part. They were happy when allowed to act as his secretary, or to assist him with his scientific experiments. However busy he might be, he gave them a great deal of his time, especially in the holidays, encouraging them to make collections, teaching them the rudiments of science, and helping them to draw and paint, etc. He encouraged their enquiries, and readily answered their questions, never being afraid to admit when he did not know the answer, but usually adding on such occasions, "That is a very good question"; and thereby pleasing the children quite as much as the most elaborate explanation could have done. Moreover, he often started the questions himself, by asking whether they had not wondered, for instance, at the numerous shapes of leaves; and, when they confessed they had never given the matter a thought, he would say: "Well, let us all think it over to-day, and to-morrow morning we will compare notes." He spared himself no trouble in the hope of arousing scientific interest, believing as he did that, though it was the inestimable privilege of few to add to the sum of human knowledge, such an interest must be to all an added delight, a solace in sorrow, and a deterrent from evil-doing.

Once he had made up his mind on such subjects as Free Trade, for instance, he was very difficult to move. His opinions having been formed after careful consideration and weighing of evidence, he no longer permitted himself to entertain any doubt on the subject, which henceforth appeared to him so simple and obvious that he found it very difficult to understand how any one could hold different views. He was never intolerant in the ordinary sense, but he felt very sorry for those who were unable to grasp what seemed to him so obvious. On such subjects as religion (where it appeared to him that we have not enough evidence to form any definite conclusions) he was invariably tolerant and broad-minded, believing that we are all seekers travelling along many paths leading towards that Great Truth not yet revealed to our finite minds. Those who knew him best are unanimous in believing that he never, in the whole course of his life, did a single thing which he believed to be wrong. So much was this an essential part of his nature that he could not bring himself to believe that others could ever deliberately do wrong either, and when wrong was done he regarded it as the result of either carelessness or ignorance. Though naturally of a melancholy temperament (at least, he has more than once told us in his books that when young he was inclined to be melancholy), he trained himself to cheerfulness for the sake of others,[1] wishing for nothing in the world so much as to be able to add to the tale of human happiness, and fearing nothing more than to add to its misery. In seeking the welfare of others, he found a great deal of happiness for himself, in a life filled with friendship, interest, solid work, and wholesome play, and, above all, in the devotion of all who knew him. That he was a deliberate optimist could be proved by many quotations, of which the following under the heading of "Tact" in the "Use of Life" is particularly characteristic: "Almost any one may make himself pleasant if he wishes."

Often purposely blind to other people's faults or misbehaviour, he may at times have lacked firmness in dealing with them; and thus he often avoided facing evil; but this refusal was a part of his philosophy. He maintained that "the main object of religion is not to get a man into heaven, but to get heaven into a man. . . . This is impossible if we allow the mind to dwell on evil thoughts . . . and those who keep their minds on what is pure and good are least likely to do what is bad." This is the attitude of many of the greatest teachers—"resist not evil," overcome it by good—and he consistently believed that no thing and no one were so bad that they could not be improved by patience, gentleness, and kindness. And if, to achieve this, he carried a pair of rose-coloured spectacles in his pocket, who can deny that, by refusing to look at much that is ugly in life, and by concentrating his attention on the beauties of Nature and the wonderful destiny and dignity of man, he saved himself and others from despair, and made for all those who knew and loved him, whether in his life or in his books a reality of his favourite quotation from Shakespeare ?—

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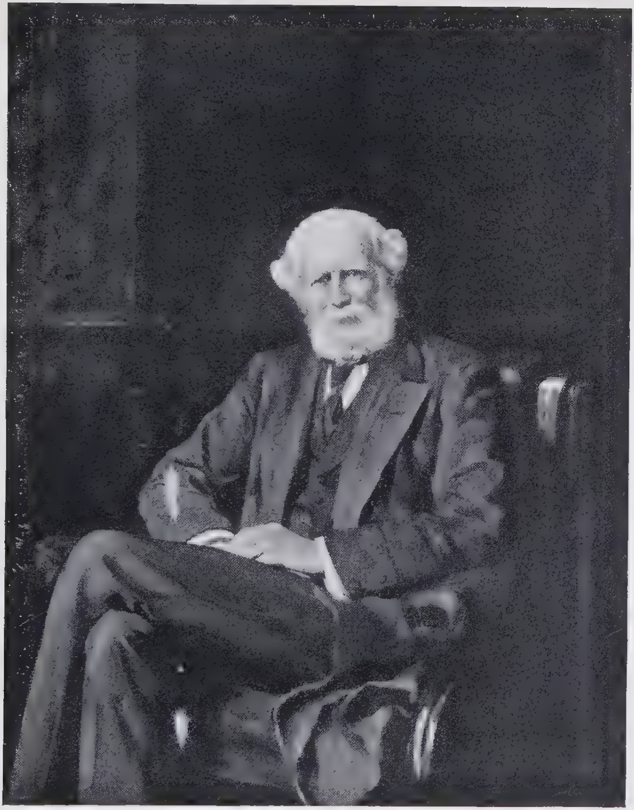
[1] See Chapter I of "The Pleasures of Life," on the Duty of Happiness.

All places that the eye of Heaven visits
Are to the wise man ports and happy havens.



LORD AVEBURY

From a Portrait by Sir Hubert Herkomer, R.A., 1911

(*Facing p.* 34)

III

POLITICAL AND ECONOMIC

By Sir Bernard Mallet, K.C.B.

It was said of the Duc de Broglie that he despised Academicians who were not Dukes, and equally despised Dukes who were not Academicians. Nothing was less characteristic of Sir John Lubbock than pride, whether intellectual or social; but it is perhaps not fanciful to perceive in the second half of this epigram some analogy to his feeling about politics and politicians. With his profound conviction of the "vital importance of science in our life," there must have been more than a tinge of impatience with members of Parliament who were ignorant or neglectful of its teachings. It would, however, be a complete mistake to give the impression that his outlook on politics was wholly or even mainly academic, or that he ever adopted the professorial pose which is generally fatal to influence in any assembly of Englishmen. Knowledge was not an ultimate end with him; he was not primarily a student but a man of affairs; and quite as strong in him as love of knowledge was his desire to share it with others, and make it subservient to practical objects in improving the social and economic condition of his fellow men. But the vast amount and variety of Sir John Lubbock's useful practical work were due to characteristics which do not always go with scientific or philanthropic tastes—to the uncommon intellectual agility which enabled him to pass without loss of time from one subject to another, and to the combination in him of thinker with acute man of business which so greatly impressed his contemporaries. Thus it was that his parliamentary career, inspired as it no doubt was by academic and intellectual ideals, proved eminently fruitful in practical results, more so probably than that of any private member of modern times. He was indeed, as this narrative will show, quite singularly successful in securing the objects which he had set before himself on entering the House of Commons.

"When," as he modestly put it, "I was first invited to become a candidate for Parliament, I naturally asked myself what use I could be if I should succeed in obtaining a seat, and I thought perhaps, as there were so few scientific men in the House (Mr. Poulett Scrope being about the only one), I might be useful on scientific questions; that my practical experience of business might, in the second place, be of some use; thirdly, I was very anxious to carry a measure to prevent the then rapid destruction of ancient monuments; and lastly, to secure some holidays and some shortening of hours for the most hardly worked classes of the community." In an earlier note he had summed up his objects as follows: (1) To promote the study of science both in Secondary and Primary Schools; (2) to quicken the repayment of the National Debt; and (3) to secure some additional holidays and to shorten the hours of labour in shops.

This statement is enough to show that Sir John Lubbock's main interests at that time were not essentially of a political, certainly not of a party, character; and that his early entrance into political life is to be accounted for by his wish to accomplish some practical reforms, and probably also, in a large degree, to a sense of what his position in life required of him in the way of civic duty and service.

It is a noteworthy testimony to the esteem which Lubbock must already have won for himself as a young man that as early as in 1863, before he was thirty, he was invited by the Liberal Committee to stand for the City of London, for which he would undoubtedly have been returned if he had accepted the nomination. For some reason, however, his father, probably because he did not wish him to add parliamentary to his business and scientific work, refused his consent to what would have been an ideal opportunity; but two years later he allowed him to stand for West Kent—a forlorn hope, in which he failed as had been anticipated. Shortly afterwards in the same year, 1865, he succeeded his father in the baronetcy and headship of the family Bank. After declining an invitation to stand for London University in 1867, he again unsuccessfully contested West Kent in 1868, but in 1870 Mr. Lee, M.P. for Maidstone, retired in his favour and he entered Parliament at the age of thirty-six, retaining that seat until his defeat in 1880, when, however, he was chosen to succeed Mr. Lowe as member for London University. Here he remained till his elevation to the peerage in January 1900, when he had nearly completed thirty years in the House of Commons.

Historians in the future will not improbably look back to these thirty years as marking the highest point of prosperity which the country and the Empire as a whole were destined to attain. Generations at any rate may well pass before the British people again reach so high a level of widely diffused comfort, of financial ease both public and private, of social and political contentment, of class union and world power, as they enjoyed in the closing years of Queen Victoria before the outbreak of the South African War. The play of political forces, aristocratic, middle class, and democratic, had produced, for the moment, a constitutional equilibrium which accompanied as it was by a singularly high standard of honour and capacity in public affairs, was highly favourable to the best elements in the national life. The political and social atmosphere which was the result of these fortunate circumstances must have been well suited to a man of Sir John Lubbock's character and temperament, and helped him to follow his varied occupations in a spirit of ease, security, and optimism which is reflected in much that he said and wrote. Living as he did on terms of intimacy with the most distinguished men of his time, some of whom were already full of forebodings about the future, his own outlook remained serene; and as a politician he was in full sympathy with the Liberal party of his day on all the main questions of Parliamentary Reform, Free Trade, Education, and so on, until the bombshell of Home Rule broke up old political friendships and associations in 1885. On this question (as well as on that of Free Trade, which again became a party question later in his life) he felt both deeply and strongly; but even then, once his decision was taken and he had followed those Liberal friends whose opinions were most in sympathy with his own, such as Lord Hartington and Mr. Arthur Elliot, into the Liberal Unionist camp and before long into steady support of the Conservative administration of Lord Salisbury, he was able to resume the even tenor of his political way in congenial company.

There would be no excuse, in a short sketch of this character, for dwelling upon political topics which have been covered over and over again in the memoirs and biographies of those who took a leading part in them. Sir John Lubbock, moreover, did not add to his other activities that of writing letters which throw any light on the working of his mind on political subjects. He seems in the main to have been content to co-operate with his political associates on all major questions; and he devoted his chief energies in Parliament to promoting the measures, generally uncontroversial in character, which he had at heart, and which, however valuable and important, do not afford much material for critical comment. In some cases, indeed, their main interest for the present generation is to illustrate the changes which time has brought about in the point of view from which they are regarded.

First among these were the measures for securing some additional holidays and for shortening the hours of labour for city clerks and shop employees. At the time of Sir John Lubbock's first Parliamentary success, the passing of the Bank Holiday Act in 1871, unremitting labour was the lot of all classes of the community save the few favoured by fortune. The fifty years which have passed since that date have brought about so great an amelioration of those conditions that many would be inclined to ask whether we had not gone too far in the opposite direction, and whether amusement and relaxation do not now play too large a part in the scheme of existence for the moral and economic health of the community. No one probably anticipated such a change as has taken place, a change which, though it may have derived its first impulse from Sir John Lubbock's Act, is due to many more far-reaching causes such as the increase of wealth and its greater diffusion among the poorer classes, the multiplication of sports and games, and the development of the means of transport. It therefore requires an effort of imagination in the present day to realise the conditions of really slavish toil which then prevailed among city multitudes and the consequent immense enthusiasm with which Bank Holidays were acclaimed. Sir John, or "St. Lubbock" as he was half humorously half gratefully dubbed, became at one bound the most popular figure in England.

At a later date he wrote as follows of this Act in answer to an enquiry for some expression of an opinion on the measure:—

> The Bank Holidays Bill met with no opposition, and, as you remind me, has now been in operation for nearly a quarter of a century. Its easy passage was, I believe, partly the result of an accident. On the old Holidays Bills of Exchange are payable the day previously—*i.e.*, Sunday Bills on Saturday. We felt that it would be difficult to extend this to the new holidays, and after some consideration we determined to propose that they should be payable the day after instead of before. Hence we had to devise some special name for the new holidays, and we called them "Bank Holidays." If we had called our Bill the "General Holiday Bill" or the "National Holiday Bill," I doubt not it would have been opposed; but the modest name of "Bank Holiday" attracted no attention and roused no opposition. It is often said that the Bill was intended for Banks only. This is quite a mistake. It expressly enacts that no person shall be compellable to do anything on a Bank Holiday which he could not be compelled to do on Christmas Day or Good Friday: and personally I have always expected that the first Monday in August, coming as it does in the glory of summer, would eventually become the most popular holiday of the year. I hope and believe that the Bank Holidays have added to the health and happiness of those for whose benefit they were intended.

Sir John Lubbock's early and rapid success in the passing of the Bank Holiday Act naturally led him to turn his attention to the condition of workers in shops; and in 1873 he introduced a Ten Hours Bill which did not reach the Statute Book. It was not till 1886 that he scored his first success in his long campaign on their behalf by the passing of the Shop Hours Regulation Act, limiting the hours of young persons under eighteen engaged in shops and warehouses to 74 weekly. In these days, when a "46-hours week" is a commonplace, this does not seem an extravagant measure of relief; but it was greatly appreciated at a time when young people often worked for 90 or 100 hours a week. During these years Sir John became connected with the Early Closing Association, on whose platform he was a welcome speaker, always drawing large audiences both in London and the provinces. In 1892 he accepted the Presidency of the Association, and was closely connected with its work from 1890 to 1913, during which period many measures of relief were passed, and his name became widely known as the great reformer of shop life.[1] It was not, however, until he reached his seventieth year, in 1904, that the principal Early Closing Bill introduced by him in the House of Lords was finally passed after a series of delays and disappointments which he felt keenly, and which were only overcome by his personal influence with the Government. It has been necessary to deal, however incompletely, with this phase of Lubbock's work because it illustrates very markedly both his strong philanthropic bent and his pertinacity and adroitness in overcoming difficulties. In measures such as these he was in advance of his times; and, like other pioneers when the causes they espouse have won general acceptance, he has been apt to miss some of the credit due to him for the energy and originality which secured success.

In these measures indeed Sir John Lubbock, though he anticipated the tendency of events, was certainly in full sympathy with the desires of the natural man; but in another subject which he took up and discussed in an admirable speech, also in his first session, he had a more difficult task, and never succeeded in making the impression which its undoubted importance deserved. This was the question of the reduction of the National Debt. It has often been remarked that the one weak point of Gladstonian finance was its failure to deal at all adequately with the debt. It is easy to see that there would have been no difficulty in reducing it to absolute insignificance if another equally important object could have been postponed to it, that of lightening the burden of taxation. To allow money to "fructify in the pockets of the people," to "free the breakfast table," were the catchwords with which Chancellors of the Exchequer excused their comparative neglect of the debt, and not only that, but permitted the growth of local indebtedness, which much more than stultified the result of their half-hearted dealings with the National Debt. If subsequent developments may somewhat have cooled our enthusiasm for national holidays, they have decidedly vindicated Sir John Lubbock's prescience on the question of the debt. "It is obvious," he said, "that as it has always been found necessary to borrow in time of war, if we do not repay in times of peace we shall go on increasing our debt till it crushes us; and national ruin will be only a question of time." This simple truth has become less self-evident than ever to a European generation which continues to exist in spite of a crushing load of debt and even insolvency; and when the figures of the National Debt of this country, then and now, are compared, it may seem to have been needlessly alarmist when it was uttered. Yet it may be noted that in the year 1871–1872, when the Budget estimate of expenditure was £72,308,000 only, the charge for the National Debt amounted to nearly £27,000,000—well over one-third of the total, and that the proportion therefore was not widely different from that of the present year, when this great liability is creating such profound disquietude. None of the evils, however, so anxiously anticipated by Sir John Lubbock actually occurred: the nation continued to grow in wealth, in population, and in a public revenue which could be raised without obvious inconvenience, until the National Debt (apart from the Local Debt) sank to a much less serious proportion of the national expenditure. An encouraging augury might be drawn from this fact in regard to the present situation if proportion were the whole story. But when we reflect on the colossal sums now demanded from the taxpayers, the crushing effect of this burden on trade and industry, and above all on the changed political and social conditions of the country, it is easy to appreciate the wisdom and foresight of Sir John Lubbock's constant insistence on the dangers of national indebtedness. It is true that the debt which caused him so much concern now looks to us comparatively trifling in amount. But if our pre-war Governments had taken his advice and enabled us to start the late war with a comparatively clean slate, we should have been in an appreciably better position to-day, for we should have been relieved of a sum not very far short of that which we now owe to the United States of America.

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[1] I am indebted to Captain Larking, Secretary of the Early Closing Association, for information on this subject.

Sir John Lubbock's whole attitude towards economic questions was characterised by the same sound judgment and common sense. He was, as I have mentioned, in full sympathy with the best economic opinion of his day on fiscal policy, Free Trade, municipal trading, and so on; and in his various addresses and articles on such questions his touch is so sure and confident that a reader might almost imagine that his views had been adopted wholesale from the text-books. His scientific habit of mind, no doubt, combined with his practical experience of business, gave him more than ordinary facility in such matters: but he had furthermore the power observable in men of executive capacity of arriving rapidly and without any apparent process of thought at conclusions which, once formed, were apt to remain unquestioned in his mind. This probably accounts for his remarkable clearness in exposition. But it is not easy for a present-day student to do justice to the great work accomplished by the liberal thinkers of Lubbock's generation, whether in science or politics, for the simple reason that most of their ideas have long since become commonplaces. It demands some effort on his part to appreciate disquisitions on much which he accepts as self-evident; and he has to remind himself that they were an essential contribution to the progress which has rendered them, in a sense, obsolete. This remark applies to much in Sir John Lubbock's speeches and writings on economic subjects. But the more they are studied the greater becomes the reader's respect for their author's judgment and foresight, whatever view he may take of their political wisdom.

Many of the political views, indeed, for which Sir John Lubbock stood and which seemed secure before he left the House of Commons have since suffered eclipse, without on that account necessarily discrediting his judgment. His opposition to Home Rule is an instance in point. That opposition was based not so much (if at all) on the fear of its leading to a disruption of the Empire as on financial objections to which no answer has yet been found, and on the impossibility of reconciling Ulster to the rule of a Southern Irish Parliament. Neither on this nor on other political matters did he ever adopt an Imperialist attitude, but he thought the Ulster difficulty insoluble by any of the Home Rule schemes propounded in his time, and it is significant that it has not now been surmounted except by the complete severance of the two Irish nations. The economic ideas, again, which he espoused, those associated with the name of Cobden, have become discredited by the course of events, by the clash of arms, and by the progress of Socialism. But it would be rash to assume that they may not still prove the antidote to much that is deplorable in the present position of international affairs. Belief in Free Trade was doubtless one of Sir John Lubbock's strongest political convictions. Whether the changed conditions of the present day, due to the devastating results of the late war upon the industrial position of the country, would have caused him to modify his views, or led him to admit that, in certain eventualities, the rigid economic arguments of the old Manchester School must give way to social and political considerations, it is perhaps useless to enquire. But it is probable that he would have looked with deep suspicion on any drastic revision of British commercial policy, and that he would have asked if there was any alternative system which would enable a country with a redundant population, largely dependent on its foreign trade for food and the raw materials of industry, to exist on its present lines. However this may be, a biographer can only emphasise the fact that up to the end of his life Lubbock remained on the one hand a convinced adherent of Free Trade (his last big public speech was delivered on this question as President of the City Free Trade Association in January 1913), while, on the other, he became more and more opposed to the Socialistic legislation—the antithesis of Free Trade or Free Exchange in its broader aspect—which became increasingly prevalent after the accession to office of the Liberal Administration in 1905; legislation on the lines of the Old Age Pensions Act, and still more of the Budget of 1909. In an article in the *Nineteenth Century* of December 1909 he criticised most of the proposals of that Budget in terms which subsequent events have unfortunately justified—those for the taxation of land values which crippled the building trade, the drastic alteration of the incidence of taxation as between the different social classes (so greatly aggravated during the war period), and the great increase of the Death Duties and the Income Tax coupled with Super-Tax, which have ended by making a numerically insignificant class the milch cow of the community. In this article he quoted the terms of a resolution passed in that year by a great meeting of the Bankers and Merchants of the City of London, "who hardly ever intervene in politics," to the effect that these increases would prove "seriously injurious to the commerce and industry of the country." These taxes would in the first instance "fall with excessive severity on capital," but also "in our opinion tend to discourage private enterprise and thrift, thus in the long run diminishing employment and reducing wages." "The Chancellor of the Exchequer," wrote Lord Avebury, "at the end of his Budget speech said, 'This is a War Budget! It is a Budget for waging implacable warfare against Poverty!' It is no doubt a War Budget, but it is not, I think, against poverty that it wages implacable war. If he had said 'against the poor' he would have been nearer the mark; for if you wage implacable war, as this Budget does, against energy, industry, and confidence and thrift, the whole nation will be worse off, but it is the poor who in the long run will be the greatest sufferers."

It is true that it was not in its immediate effects that this Budget was so detrimental as the above quotation would imply. Its real vice was that it anticipated resources which should have been reserved for another war, a war for national life or death, which was so soon to come; and made it impossible to meet that call without producing the results foreshadowed in the above words. Needless to say such warnings passed almost unheeded at the time, for then, as now, the City of London, even when it did take the trouble to express its opinion in a collective capacity, was strangely impotent to influence the fiscal legislation of a democratic House of Commons.

Dogmatic as some of his expressions of opinion may sound, it is worth while to point out that Sir John Lubbock was no doctrinaire. If his scientific training inclined him, in political matters, to look for and be guided by principles derived from the observation of concrete facts, his thoroughly English type of mind and his practical sense of how to get things done preserved him from an attitude which is usually in this country considered a reproach, and which is certainly hampering in the complexities of political life. He did not, for instance, allow his instinctive opposition on general grounds to State regulation to interfere with his efforts on behalf of shop assistants, once he had convinced himself by personal investigation of the injurious effects of excessively long hours on the comfort, health, and well-being of those concerned, and of the impossibility of ameliorating these conditions except through the action of the State. But I think it must be admitted (and it is greatly to his credit as a politician) that he was less inclined than most men to mere opportunist concessions. Perhaps, however, the most notable effect of his scientific training was to make him extremely cautious about political catchwords and political nostrums. There is an amusing story about his son Eric when a very small boy, which Lord Avebury delighted in telling, especially to journalists. Finding the child deeply engrossed one day he asked him what he was doing, and received the answer, "I am writing a book on workhouses and slums!" Lord A.: "But what do you know, my darling, about either?" Eric: "Of course I don't know anything, Daddy; I just make it up as I go along!" Lord Avebury would often add that the world would be saved much suffering if this method were less general. The same point is illustrated by the following passage from an address of his at the Darwin-Wallace celebration. Quoting a sentence from Darwin's autobiography, "With the exception of the coral reefs I cannot remember a single hypothesis which after a term had not to be given up or greatly modified," Lord Avebury went on: "The same remark applies to politics. How many laws have had exactly the opposite effect to that which they were intended to secure! It is one of the great dangers of the present that first impressions are so often wrong; second thoughts are safest. It would be well to bear this in mind in some of our present discussions, and in proposals for more inspection, regulation, and state interference in all directions. In all such questions, if we are to arrive at wise conclusions, we must look below the surface and not let our feelings run away with our judgment."

It is now time to attempt some more detailed survey of Sir John Lubbock's parliamentary career. His record during his first year or two in the House of Commons is worth giving, foreshadowing as it does almost all his subsequent activities and showing how little time he lost in making good the promises he had made to himself at the outset. Incidentally it may be noted that the year of his election to Parliament (1870) witnessed the publication of "The Origin of Civilisation," one of his early great successes in the popularisation of scientific ideas. His maiden speech (April 8th, 1870) on Military Education, full of facts and telling argument, anticipates most of his work in modernising and improving education, was far in advance of his age, and is not out of date to-day. In the next session he spoke on a motion for the reduction of the National Debt, on the Budget, and on Endowed Schools and Elementary Education, urging that History, Geography, English, and Elementary Science should be included in the examination. On May 15th, 1871, his Bank Holiday Bill passed its third reading, and in the same year he introduced Bills for the Better Preservation of Ancient Monuments and the Amendment of the Endowed Schools Act, and drafted a Bill on Shop Hours. Three or four years of this sort of work gave him the reputation, as a well-known writer in *The World* put it, of a "man of universal mind" who "had strolled into Parliament," but was "hardly a politician, and at all events absolutely devoid of political partizanship. . . . He has come to the conclusion that there are certain truths clearly ascertainable in finance and that they should be enforced, but he is not less clear that the condition of the people, moral, social, and mental, should be improved. . . . Both in politics and science Sir John Lubbock is tolerance and good breeding personified. He was not at a University, but he was at Eton, and never was there Etonian yet on whom Eton has more vividly and gracefully left her influence. The true impression is that Sir John Lubbock, banker, *savant*, member of Parliament, is a country gentleman to whom science—and science not lightly treated but completely mastered—has been a relaxation and pursuit, just as classical studies were to a byegone generation of statesmen."

This extract, superficially true enough, gives, however, the impression of a lighter weight in public life than Sir John was, or was to become. It may be supplemented therefore by a perusal of the circular issued to the electors of London University (of which he had been for eight years Vice-Chancellor) when he became a candidate for the seat in 1880. It is an admirable summary of his work in the City, in science, and in Parliament. "Sir John Lubbock's career as a Member of Parliament since he first entered it as representing the Borough of Maidstone in the year 1870 has been marked by a success as brilliant and by an industry as unwearied as his career in the City. In addition to the usual labour of attending meetings, Sir John Lubbock has succeeded in passing through the House of Commons no less than eleven measures the character of which is best indicated by their titles, namely: (1) Apothecaries Acts Medical Act

Amendment Bill; (2) Bank Holiday Bill; (3) Falsification of Accounts Bill; (4) The Bankers Book Evidence Bill; (5) The College of Surgeons Medical Act Amendments Bill; (6) The University of London Medical Act Amendment Bill; (7) The Factories Act Amendment Bill; (8) The Bills of Exchange Bill; (9) The Dental Practitioners Bill; (10) The Companies Act Amendment Bill; (11) Ancient Monuments Bill, which last, however, was thrown out in the House of Lords. He was a Member of the Permanent Committee of Public Accounts. He has taken an active part in most debates relating to financial and educational questions . . . and has served on three important public commissions, the Public Schools Commission, the Royal Commission for the Advancement of Science, and the International Monetary Commission."

With such a record behind him, with a safe seat which he was to hold for the next twenty years, and with a well-deserved reputation as an authority on public finance and economics, it might have seemed that, at the age of forty-six, Sir John Lubbock had the political ball at his feet. Whether in point of fact he was at that period looked upon by his contemporaries as a likely candidate for political office it is impossible at this distance of time to ascertain, but it is tempting, though perhaps unprofitable, to speculate as to the reasons for his failure to attain it—if indeed he desired it. The fact remains that there appears to have been no question of his joining Mr. Gladstone's Government in 1880. Possibly the loss of his seat for Maidstone and the lapse of a few weeks before his return for London University may have put him out of the running on that occasion, and later on the break-up of the party to which he belonged, as the result of Mr. Gladstone's leadership and the subsequent emergence of the Home Rule question, were enough to wreck many promising careers on the

Liberal side. For many years the only Liberal Unionist holding office in a Conservative Government was Mr. Goschen; and when the time came in 1895 for a fusion between the two wings of the Unionist party, Lubbock was past middle life, and there was no room among the limited number of ex-Liberals included in Lord Salisbury's administration for any who had not taken a prominent part in the Irish controversy. His position in the House of Commons had, however, been properly recognised in 1889 by his nomination to the Privy Council on the recommendation of Lord Salisbury, who was also responsible for his elevation to the peerage eleven years later.

These years then, though they were not destined to be crowned by political advancement, were the fullest and most fruitful of his career. In every direction his activities expanded. In 1882 indeed he gave up regular attendance at the Bank in order to devote himself more fully to scientific and political work, but a reference to the list of dates at the end of this volume will show the number of the City interests which claimed his attention. A banker in the modern sense, presiding over a huge joint-stock concern with world-wide responsibilities which claims every hour of a man's time and thoughts, Sir John Lubbock, of course, never was. But neither was he the private banker of old times, content to draw a comfortable income from a business which more or less managed itself. He was always to the fore in the banking community, and active as a member, and often as chairman, of the various committees and institutions concerned in promoting their interests and those of the public. He had, for instance, in his earlier days, been instrumental in bringing about a valuable piece of banking organisation, the institution of the Country Cheque Clearing House, which he carried through in 1858. The origin of the London Bankers' Clearing House can be traced as far back as 1770, but there had arisen in the meanwhile a considerable agitation among the country bankers to start a Country Clearing House. Before anything final was done, Sir John was asked to join the Committee, and subsequently formulated a plan by which the work could be done in the London Clearing House. He persuaded the London Bankers to adopt his scheme, which does not differ materially from that now in force; and later on he suggested the publication of the Clearing House returns, which was agreed to. He gave an account of these transactions in a paper read before the Royal Statistical Society in 1865, which was followed by his election as a Fellow. It may be not out of place to mention here that he was for many years closely connected with the proceedings of this Society; that in 1900, as Lord Avebury, he accepted the office of its President; and that in this capacity he delivered two clearly reasoned addresses in which he took the opportunity to express his opinions on the growth of local and national expenditure, the incidence of taxation, municipal trading, and other allied topics.

Typical also of Sir John Lubbock's work in the City was his connection with the Corporation of Foreign Bondholders for the protection of the interests of British investors in foreign securities, of which he was one of the founders and a member for forty years, from 1873 to 1913. He acted as Deputy Chairman of the Council of the old Corporation for sixteen years and as Chairman for eight years. Owing to pressure of other work, he resigned the Chairmanship in 1898, but at the unanimous request of his colleagues on the Council he in 1900 became President of the reconstituted Corporation and remained in that position up to his death. He took the deepest interest in the varied work of the Institution, and was assiduous in his attendances, not only at the meetings of the Council, but also at those of the Bondholders' Committees, of all of which he was *ex-officio* Chairman, affiliated to the Corporation. His never-failing courtesy, combined with his sound judgment, his intimate knowledge of business, and his large circle of friends in the world of finance and politics, made him an ideal President of the Corporation. He rendered it a most signal service in obtaining from Parliament in 1898 a special Act reconstituting the old Corporation, which freed it from many difficulties to which it had been previously subjected, and it is satisfactory to think that he lived long enough to see the good results brought about by his action.

The Secretary of the Council, to whom I am indebted for the above information, remarks: "I don't remember ever hearing him say a harsh or unkind word. I recall one occasion when he spoke a little sharply to one employé whose hesitation and want of lucidity irritated me beyond endurance. When he left the room Lord Avebury turned to me and said: 'I am afraid I spoke rather impatiently to ——, who no doubt was doing his best.' Next time he saw him he went out of his way to put him at his ease."

Sir John Lubbock's Presidency of the Jubilee Meeting of the British Association at York in 1881, where his presence and address aroused great enthusiasm, marked his position as the leading popular exponent of scientific knowledge, a reputation enhanced by his publication of a work of real research, "Ants, Bees and Wasps," in 1882, and by many similar works in subsequent years. In this connection a word may be added about his interest in Eugenics, a subject now only beginning to excite wide popular interest. Francis Galton was not only one of his oldest and most valued friends, but also one whose researches he believed to be of the greatest promise for the future of the human race. He was in active sympathy with the objects of the Eugenics Education Society founded by Galton and presided over by Major Leonard Darwin (son of another of his oldest friends), and clearly saw in this comparatively new science the key to the solution of some vital social problems.

In general literature the publication of his "Pleasures of Life," his "Use of Life," and the "Hundred Best Books" made him a household word to hundreds of thousands who knew or cared little about his eminence in science or politics. Society and family interests, absorbing enough in themselves as they were in his case, are dealt with in other chapters. None of these distractions, however, prevented him from attending to his political and parliamentary duties as if he had little else to occupy him, and adding to the tale of measures standing to his credit, which before the end reached a total of some twenty-nine Acts of Parliament.[1] In 1882 his first Ancient Monuments Act was passed, together with a Bills of Exchange Act, and almost every succeeding year witnessed a similar triumph, among which may be mentioned the Shop Hours Regulation Act in 1886, the Open Spaces Acts in 1887 and 1890, and the Public Libraries Amendment Act in 1890.

These measures are typical of the kind of legislation which Sir John Lubbock was always promoting—measures which, however badly they may be wanted, are too often neglected because it is no one's business to take them up. They were measures directed to the public good, but not measures of the vote-catching, eleemosynary sort so much more attractive to the ordinary aspiring politician.

When already a member of the Education Commission, Sir John accepted an invitation from Lord Randolph Churchill in 1886 to join the Royal Commission on the Currency (Gold and Silver Commission), which led to much work on the question of Bimetallism. It would be of interest to know how far he approached this question with an open mind, a difficult matter for a London Banker, and how far he examined into the abstract scientific arguments on a subject which exercised the keenest intellects on both sides; but there is no reason to suppose that he was ever in doubt on the subject, and he ended by accepting in 1897 the Presidency of the Gold Standard Defence Association.

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[1] A list of these will be found at the end of this volume.

In 1887 he became Chairman of the Public Accounts Committee, a standing House of Commons Committee which is no sinecure, and which brings its members into close touch with the Treasury and other public departments. This work was very congenial to him.

Another question which first attracted his attention in the year 1884, when proposals were laid before Parliament for the extension of the franchise and the redistribution of seats, was that of Proportional Representation, a subject which made an irresistible appeal to a mind like that of Sir John Lubbock, trained by scientific investigation, moderate, tolerant, and logical. In March of that year, as President of a new Proportional Representation Society,[1] he placed the arguments in its favour before the House of Commons in a most convincing speech (see *Times*, March 4th, 1884), influenced as he said not so much by the importance of the representation of small sections, in his opinion a "very small part of the question," as by anxiety that the great parties of the State should be fully and fairly represented in the different districts of the electorate, which he showed was certainly not the case under the existing system. He fought the question as a matter of principle throughout the franchise controversy, which, it will be remembered, nearly ended in a constitutional deadlock in the autumn of 1884. Although his campaign proved unsuccessful, he met with a surprising amount of support among the rank and file in the House of Commons, and secured the adhesion to his proposals of many of the most distinguished members of Parliament of the day, not all by any means of the cross bench order of mind, but including, of course, Mr. Leonard Courtney (afterwards Lord Courtney of Penwith), who sacrificed a leading position in the Government to his belief in this cause. For twenty years the question then slept, though Sir John Lubbock had some opportunities of pointing out the evils and anomalies of the existing representation system, such as the practical extinction of the loyalist party in Southern Ireland. But in 1905 a new Redistribution Bill caused the revival of the Society, which held its meetings in Lord Avebury's house in St. James's Square until it outgrew the accommodation of a private residence. It has been remarked that this was the only subject of his endeavours in which no result was achieved. The remark, though true as yet of our own Parliament, requires some qualification, for Proportional Representation was unanimously recommended for cities and populous areas by the Speaker's Conference on Electoral Reform in 1918, and in one form or another has been carried into operation in most other countries. Its early introduction into the British electoral system seems increasingly probable ; and it will then remain to be seen whether practical experience will justify Lord Avebury's strenuous advocacy of this principle, which probably did not add to his popularity among party leaders and party politicians. Leaving aside technical difficulties, the one serious criticism to be met, suggested in a striking form by the recent history of Italy, is whether it may not contribute, by a too complete representation of various shades of political opinion, to the paralysis of parliamentary government, and the consequent reaction against it which is so sinister a feature of modern democratic politics. I may add that his little book entitled "Representation," first published in 1885 and several times re-edited since, is still the most valuable contribution to the written propaganda of the subject for clearness and thoroughness.

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[1] I am indebted for particulars to an admirable article by Capt. Alfred J. Gray, Sec. of the Society.

But the most outstanding piece of public work which fell to him, almost, as it were, accidentally, and certainly unsought, was in connection with the then newly created London County Council, which first came into existence in 1888. He was asked in December of that year by both the Liberal and Conservative Associations to stand in the first election of four representatives of the City of London, and in the following January he was returned at the head of the Poll, Lord Rosebery coming second. The work proved unexpectedly heavy. He writes for instance on February 1st: "First I had, as almost every day now, a County Council Committee, then I went to the opening of Parliament, and brought in two Bills, one enabling local authorities to establish a weekly half holiday for shops, and the other my Factory Acts Bill." On March 2nd again: "Have had a heavy week of County Council Committees," and again on March 12th: "County Council. It is really taking an immense amount of my time." Probably more than he bargained for; certainly more than his friends thought possible for him, as the following anecdote shows: "Frederic Harrison," writes Sir Mountstuart Grant Duff,[1] "told me that when it was proposed to throw some new work on Lubbock in connection with the L.C.C., Acton had said, 'No, no! He has quite enough to do with his Ants and other relations.'"

Worse was to come, however, for in July 1890, on Lord Rosebery's resignation of the Chairmanship, Sir John was unanimously selected as his successor, and carried on till the early spring of 1892, when he also found it necessary to retire; though he remained for a time on the Council as an alderman and took a leading part in opposition to the municipal policy and finance extravagances of the Progressive party. Lord Rosebery's words on this occasion give a glimpse both of his difficulties and of his success in the important office of Chairman. "I am afraid you have had great trouble of late, alone in your Chair without Deputy or Vice in any form"—Lord Farrer had been away ill and there had been great fights over finance and loans—"and with Chairmen crumbling around you. But you have fairly crested the wave, and not content with presiding over all London wholesale, and half London in detail, you have written (I suppose with your unoccupied toes) two articles on London subjects this month: you are a marvel."

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[1] Notes from Diary, 1889–1891, Vol. II, p. 206.

And so, while taking his full share in House of Commons work (he was a strenuous critic, for instance, of Sir William Harcourt's Death Duties Budget), he accepted more and more calls from outside as well as increasing those he made on himself.

This growing pressure would have been intolerable to an ordinary man, or to one of less versatility, and less genius for parcelling out his time among his various duties and occupations.

Even to him, however, his transfer to the House of Lords at the beginning of the year 1900 must have come as a considerable relief, though the change made less difference to him than it would have done to a politician of the normal House of Commons type. For in the Upper House he was able, almost as effectively, to promote the causes he had at heart, and as a peer he had perhaps a better platform for ventilating his ideas, particularly on international politics, in which he was taking a growing interest.

As I have before remarked, Lord Avebury had early adopted more completely than many of his contemporaries a Cobdenite position in foreign as well as in home affairs.

Not that he was a "Peace at any price" man, any more for that matter than Cobden himself; he was for instance a supporter of the Government throughout the Boer War, and he was as far as possible from any tendency to crankiness, but he was a man of science, a philanthropist, and an economist, and from all these points of view Internationalism appealed to him as Imperialism certainly did not.

> "Sociology," he said, in a Presidential address to the Sociological Society in 1908, "is the science of good fellowship; it represents the desire for the well being of our countrymen, and in the international aspect that of mankind; it ignores the term foreigners, regarding all men as brothers.
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> "The latter part of our name is also most important. In their ultimate object Socialists or Sociologists have much in common. Their methods, however, are far as the poles asunder. Socialists wish to benefit mankind, without much considering how. They have lofty aims and excellent intentions, but—at least as it seems to me—without Science. We sympathise with their aspirations, but fear that in the result their methods would defeat their own object; wishing to do good, they lower those they desire to raise, pauperise those they wish to help, and make their victims more dependent instead of independent. Honestly wishing to make the poor more comfortable, more thrifty, and more independent, the result, I fear, will be the exact reverse.... Mankind in general desires to obtain the maximum of effect with the minimum of effort. . . . There is indeed no practical limit to the number of those who may be tempted over the border line, and reduced to paupers, if public funds are freely devoted to the purpose. . . . Some people seem to think that the State is omnipotent, and that its purse is inexhaustible. But every penny in the coffers of the State is taken out of the pockets of the people, and though the State is very powerful for good, it is certainly as powerful, and perhaps even more so, for

> evil. . . . And it is obvious that the relief given must not be such as to keep the unemployed in, and still less to tempt others into, the congested districts, or to weaken their desire to find work for themselves. . . . The Labour Exchanges seem a hopeful experiment. The labourer has two things to do, to work and find a market for his work. Helping him to do so seems an important step in the right direction. . . . Philanthropy is noble and unselfish, but if it is to do good, it must also be wise and careful. It has done much, but Friendly Societies and Savings Banks, Temperance and Co-operative Societies, have done even more to raise the poorer classes and to make them happier."

I have quoted this passage not only because it well summarises his position on the domestic issues which are more and more urgently claiming attention, but also because it indicates the point of view from which he looked at foreign relationships. "One of the greatest dangers of civilisation, one of the greatest blots on human nature, was the jealousy and ill-feeling between different nations, and one of the noblest services which Mr. Gladstone had rendered to his countrymen, and he might say to the civilised world, had been by promoting the settlement of international differences by the rational and Christian method of arbitration, rather than by the cruel and barbarous chance of war." So he had spoken on the occasion of Mr. Gladstone's retirement from the House of Commons in 1894, and at the beginning of the present century he was one of the first of our statesmen to realise the alarming situation into which Europe was drifting. At that time the danger arose from serious misunderstandings with France, in which country it was generally believed that an aggressive war against her was the settled policy of England. Lord Avebury wrote by invitation a letter to the *Gaulois* with the object of dispelling this idea, which he did in vigorous terms, expressing his belief that, in spite of minor differences, in by far the most numerous and important problems the interests of France and England were identical. He followed this up in his practical fashion, and against the advice of Lord Salisbury, by a visit to Paris as President of the Associated Chambers of Commerce. His visit turned out a triumphant success, and may, as his biographer observes, almost be regarded as the first step towards the Entente between the two countries.

But that he did not see further than other people, or regard friendship with France as incompatible with friendship with Germany, is shown by his efforts, five years later, when Lord Lansdowne's tenure of the Foreign Office had established the Entente and German shipbuilding had begun to create anxiety in this country, to bring about a similar understanding with Germany. In 1905 he took the Chair at the first meeting of the Anglo-German Friendship Society, and himself engaged in some correspondence with Prince Bülow in reference to a speech in which the latter had spoken of the "profound dislike of England for Germany." That a certain impression was produced in Germany by these efforts was proved by many friendly resolutions transmitted to Lord Avebury; and two years later, when the German Emperor visited this country, Lord Avebury endeavoured to get a clause inserted in the address which he presented to the Emperor on behalf of the Society insisting on the mutual benefit of a reduction of armaments on both sides. Count Metternich, the German Ambassador, however, would not agree to this, and implored him with tears in his eyes not to mention this subject in the presence of the Emperor. The deputation had, therefore, to be content with a few gracious words from His Majesty in which he spoke strongly on the importance of peace and goodwill to both countries. Lord Avebury had thought the Imperial visit a good opportunity for a little peaceful propaganda and it grieved him deeply not to be allowed to say a word about the burden of huge armaments. Not long before he died he wrote: "The present state of Europe is a danger—nay more, a disgrace to us all." He ended his correspondence with Count Metternich with these ominous words: "I hope you will not think I am taking too great a liberty in expressing my views, but I have, as you know, special opportunities of forming an opinion, and if the present state of things continues I foresee great danger to all thrones, and the certainty of suffering to your people and ours." Lord Avebury's instinctive dread of a coming clash, which, fortunately for himself, he did not live to see, is clear enough from all he said and wrote during these years; but whether he anticipated it in the form it was to take, any more than most of those who were better placed than he was to know the truth about German intentions and preparations, it is difficult to say. This incident, however, went far to open his eyes.

Mention should be made in this connection of the interest which he had taken, as far back as in 1889, in the question of exempting private property at sea from seizure and capture in time of war. In 1889 he had raised the question of a modification of the Declaration of Paris in this direction with Lord Lytton, then Ambassador in Paris, but without result. Now again in 1910 he took up the matter in the same sense in connection with the ill-fated "Declaration of London," and followed up a Memorandum which he addressed on that occasion to the Chamber of Commerce of London by an article setting out his views in the *Nineteenth Century* in December 1912. The arguments he used on this occasion are of interest as illustrating his constant desire for international amity, or, failing that, for some mitigation of the horrors of war. Like other advocates of this measure, whether in the Government or outside, he attempted to show that besides serving the cause of humanity it would also be to the advantage of the country whose carrying trade was the greatest in the world to adopt it. The only comment which it seems necessary to make is that, if these proposals had been accepted and the strongest of naval Powers had deprived herself of her chief weapon as she was so near doing, the defeat of Germany in the war which was so soon to break out would have been an impossibility.

It is related that in his early days Lubbock once remarked to Charles Darwin that it was his aim in life to become President of the Royal Society, Lord Mayor of London, and Chancellor of the Exchequer; and that Darwin's comment was that he could have reached any one of these positions if he had been content to give up the other two. This story, whether accurate or not, is an example of the sort of criticism which has often been made on Lord Avebury's career. Criticism which implies that he did not make the most of his opportunities and his abilities would of course be very wide of the mark, but the question is whether, if he had concentrated his powers on fewer objects, he might not have reached greater heights. I do not know that he would have left so considerable a mark on his generation as he did if he had so limited his ambition: and even on the lower ground of personal distinction it is difficult to see how his record could have been bettered. It is indeed possible that in science, which demands single-minded devotion, he might have won a name among the greatest if other activities had not claimed him; but the most eminent of Lord Mayors or of bankers do not necessarily secure the homage of posterity, and history records the names of Chancellors of the Exchequer whose memory has hardly survived their own generation. However this may be, Lord Avebury was, like other men, what circumstances and his own nature made him. Circumstances plunged him unusually early into a business career, and his well-balanced nature enabled him not only to interest himself effectively in that, but to fill up every moment of his leisure, to his own great satisfaction, in following up his other studies and pursuits, the chief of which soon became scientific. If duty in the first instance called him to the City, inclination led him to scientific study, and public spirit drew him to political and social work. Thus a multiplication of occupations became a necessity and a habit with him almost from boyhood, and was doubtless also congenial to him as primarily a man of action rather than a thinker or student—unlike his contemporary whom the intimate friend of both, Sir Mountstuart Grant Duff, used to speak of as the "divine Acton," the wonder of his age for his boundless knowledge and learning.

It is happily unnecessary to compare the claims of two such different types to the admiration of their fellow men. Lord Avebury at all events was one of those who are always on the look out to put their talents to practical uses, and I do not suppose it ever occurred to him to limit his energies and activities. His aim, on the contrary, was so to organise his life as to enable him to follow up his multifarious pursuits, to cultivate his mind in various directions, and to make the fullest use of all openings and opportunities, both for rational enjoyment and usefulness to others.

"No man," he wrote, "could be deemed properly educated unless he had some acquaintance with all the great departments of human knowledge." Except that he was indifferent to style and form, whether in art or literary expression, in comparison with meaning and sense, it was the old Greek ideal of an educated gentleman which consciously or unconsciously he set before himself; and it is impossible to read his books on the "Pleasures" or the "Use" of Life without feeling that he could never have bent his mind to the rigid specialisation which is now generally considered essential to the highest success in life. So far did he carry the opposite method, in accordance with his maxim that "the human mind like the human body requires variety for its nourishment," that it is said he seldom spent more than half an hour on any particular book: and on a railway journey, for instance, was wont to provide himself with three or four books on different subjects, which he read in turn. None but a man of much strength, mental, moral, and even physical, could have derived benefit from such a dispersal of energy, or afforded himself the luxury of such all-round training.

Even in his case equal success from all his adventures in life was hardly to be expected, and it is sufficiently remarkable that he should have failed in none. Certainly he cannot be said to have failed in politics, though he never attained political office of any kind. Probably if it had been pressed upon him he might have accepted it, as he did so many other duties congenial and otherwise. But he cannot be said to have laid himself out for it. It would never have occurred to him to sacrifice to party expediency any object which he had at heart. He had his own ideas of what he wished to accomplish in Parliament, and he pursued them serenely and pertinaciously quite irrespective of ordinary political, party, or personal considerations. It would be idle, moreover, to pretend that he possessed the peculiar gifts, oratorical or personal, which are necessary to force a man to the forefront in the political arena. Although always lucid and fluent, he was not, owing perhaps to a weak voice, an impressive speaker or debater. But these were disqualifications which, as I have suggested above, would probably not have stood in his way had the political conditions been more propitious than they were. As it was he remained one of a class much rarer in these days than in the past—that of the private member who, while conscientiously supporting his leader and performing his parliamentary duties, is known to be indifferent to office, and whose ability and independence of character often give him more influence in the House than a Minister. Such men, often capable and distinguished, were generally content to be silent and retiring as Members of Parliament; and if Lord Avebury had resembled them in this respect his life would hardly have lent itself to political commemoration even of the modest kind attempted in these pages. Wisdom, high character, and self-sacrificing devotion to public interests he may have shared with many others; but in degree few can have surpassed him in these qualities. In his House of Commons days, moreover, Lord Avebury stood out from among the ranks of the private members by reason of his legislative activity and his frequent and able participation in debate. And the fact that he established a real title to parliamentary fame by his record as a law-maker is in itself a sufficient vindication of his career as a politician.

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In order to make the bibliography complete it would be necessary to add references, not only to his numerous speeches in the House of Commons and House of Lords, but also to the many articles which he published in various reviews and periodicals, including eighteen in the *Nineteenth Century* alone.

IV

ANTHROPOLOGY

By Sir Arthur Keith, F.R.S., Past-President of the Royal Anthropological Institute of Great Britain and Ireland.

I. *John Lubbock and his Early Associates.*

To understand the share taken by Lord Avebury in laying the foundations of Modern Anthropology we have to follow his career from 1849, the year in which he entered his father's bank at the age of fifteen, until 1860. In this year a short visit to the valley of the Somme brought home to him, with the flash of imagination which comes only to genius, the full significance of the discoveries which had been made by Boucher de Perthes in the gravel beds laid down by the Somme in ancient times. In this short period of eleven years he passed from being an industrious schoolboy, with tastes for Natural History and Geology, to a place among the leading anthropologists and archæologists of Europe.

In the brief period just mentioned (1849–1860) a small company of Englishmen, with whom young Lubbock was intimately associated, gave Man a new history of himself and of his civilisation. At the beginning of this period the conviction was deeply rooted that humanity in all its varieties, and in all that it did, thought, and believed, had a history of less than 6000 years; by the end of this period the small Darwinian advance-guard had torn Archbishop Usher's chronology to tatters and carried man's history into an unlimited past. When we look beneath the surface of the events which took place at this time we see that the revolution was centred in Darwin's home at Down, situated high on the chalk plateau of Kent, some eight miles beyond the South-Eastern outskirts of London. Rather less than three miles to the east of Down, situated on the side of one of those beautiful green glades which cut into the Kentish Downs, was High Elms, the residence of Sir John W. Lubbock, banker, mathematician, astronomer, and, like his friend Darwin, a distinguished Fellow of the Royal Society. The proximity of High Elms to Down was a factor of the utmost importance in determining the bent of young John Lubbock's scientific career. His aptitude for investigation was inborn; his love of living things was his own; but it was his constant contact and intimacy with Darwin which opened for him the windows of the Past. In 1852 we find this youth of eighteen already assisting Darwin and collaborating with him. The subjects pursued were purely zoological, but the methods employed and the experience gained were just those required in the pursuit of Anthropology. Young Lubbock was nurtured in the cradle of Evolution, and when he came to write books on the early history of Mankind he marshalled his facts and presented his evidence in the manner of his early mentor, Charles Darwin.

In undermining the old and in establishing the new or evolutionary chronology, Sir Charles Lyell played a part earlier than, and almost as great as, Darwin himself. The eye of the great geologist was soon turned with approval upon the eldest son of his old friend, Sir John W. Lubbock, and in 1855, and when the future Lord Avebury had just reached his majority, proposed his election to the Geological Society. At the time of his election the Society was finding it increasingly difficult to reconcile geological theories with Biblical history, and was actually suppressing facts which did not tally with the accepted belief of man's recent creation. Two men he met amongst the geologists who were destined to become his colleagues in opening up the earlier chapters of man's history. One was Joseph Prestwich, F.R.S., a wine merchant in the City, who was investigating the more recent geological formations of England, particularly the gravel beds found along river valleys such as those of the Thames—just the deposits which should carry evidence of ancient man, if man had actually existed in remote times. Prestwich was twenty-two years senior to young Lubbock. John Evans, the other friend made in 1855, was a paper-manufacturer and student of prehistoric stone implements; he, too, was Lubbock's senior by eleven years. Then, in the following year, he commenced his intimacy with the incisive Huxley, his senior by nine years, and at the same time a close friendship began with Mr. George Busk, also much his senior. Mr. Busk, although a surgeon by profession, had ample private means; he became a distinguished President of the Royal College of Surgeons. It was he who in 1859 made known to English readers the fossil remains of an extinct type of humanity, discovered in 1856 at Neanderthal, in Germany.

Such was the group of men who moved forwards with young Lubbock to do battle for Darwin when "The Origin of Species" was published towards the close of 1859. Our young naturalist was then twenty-five years of age and already a Fellow of the Royal Society of more than a year's standing. There was one further important member of this company—Hugh Falconer, born in 1808 at Fochabers, in Scotland, famous for discoveries of fossil animals in India made while serving as a surgeon in that country. At the time of which we write he had returned to England, and was interested in the fossil animals found in caves and was searching for evidence that man had been their contemporary. Mr. Joseph Prestwich had married Falconer's niece, and to understand a certain event in Lubbock's career as anthropologist, this relationship has to be kept in mind. The names of two other men, although they joined Lubbock's company at a somewhat later date than the one with which we are now dealing, must be mentioned here. One of these was Francis Galton, Darwin's cousin, born twelve years before Lubbock; he also became an anthropologist, one who studied primitive races and the manner in which the laws of heredity could influence the evolution of mankind. Then last, but certainly not least, was Mr. E. B. Tylor (1832-1917), slightly Lubbock's senior, who was to devote his life to unravelling the origin of man's culture, customs, and beliefs—the same problems as were to occupy Lubbock's intervals of busy leisure. One cannot help noting that of this group of associates Huxley was, in the strict usage of the term, the only professional scientist; all the others were men of means or masters of a business, pursuing science as a pastime. At this period of its history English science was carried forwards on the shoulders of a volunteer army. Lubbock's genius must, as we have seen, be counted precocious; he was the junior member of the company of pioneers who in the early 'sixties hewed their way into the fields of the Past where ancient man had disported himself.

II. *How he was drawn to the Study of Anthropology.*

We now come to deal with the series of events which opened Lubbock's eyes to the remoteness of man's past. In 1858 Falconer, Prestwich, and Pengelly, while investigating a cave at Brixham on the south coast of Devonshire, found embedded in its floor the fossil remains of a bear, and underneath the fossil remains a stone implement clearly fashioned by the hand of man. Here seemed to be definite evidence that man had lived in England with extinct animals and before the "Flood." This same year Falconer had to cross France on his way to Sicily, and broke his journey at Abbeville, near the mouth of the Somme. There he met an exciseman, Boucher de Perthes, who, for nearly thirty years, had been trying to convince his countrymen that in the gravels on the sides of the Somme Valley were to be found fossil remains of extinct animals and with them stone implements shaped by the hand of man. Falconer examined the collection of implements and fossils made by Boucher de Perthes, visited the gravel pits in which they had been found, and was convinced that the exciseman had made a momentous discovery. He wrote an account of his encounter to his relative, Joseph Prestwich, who had made a special study of the gravel terraces and deposits of river valleys. In the spring of 1859 Prestwich, taking Mr. John Evans with him, visited Boucher de Perthes; they saw and were conquered; clearly man had lived in the valley of the Somme when that river flowed on a bed which was 100 feet and more above its present level. They returned and reported what they had seen. By the end of the year Mr. Evans had found stone implements embedded in the gravels of the Thames Valley exactly similar to those found by Boucher de Perthes in France.

It was a life-long regret on the part of young John Lubbock—he married in 1856—that a pressing engagement had kept him from accompanying Prestwich and Evans to the Somme in 1859; but in the following Easter, 1860, he had his wish fulfilled, for he, Mr. Busk, and Capt. Douglas Galton were of the company which Prestwich led when he re-visited Boucher de Perthes and the scenes of his discoveries. Of all the company it was young Lubbock who had the clearest realisation of the bearings of these new discoveries on the past history of Man. His association with Darwin had prepared his mind to deal with such a situation as had now arisen; here, before his eyes, lay the valley of the Somme with its old gravel-terraces, remnants of ancient beds of the river, stranded on its sides, proclaiming the antiquity of man's history and the uncharted fields of man's past. "I am sure," he wrote, "no geologist could return from such a visit without an overpowering sense of the change which has taken place and the enormous time which must have elapsed since the first appearance of Man in Western Europe." And again: "While we have been straining our eyes to the East, and eagerly watching excavations in Egypt and Assyria, suddenly a new light has arisen in the midst of us, and the oldest relics of man yet discovered, have occurred, not among the ruins of Nineveh or Heliopolis, not on the sandy plains of the Nile or the Euphrates, but in the pleasant valleys of England and France, along the banks of the Seine and Somme, the Thames and the Waveney." We may be certain, too, as he surveyed these gravel deposits of the Somme, the memory would come back to him of the morning in 1855 when he and Charles Kingsley discovered the fossil remains of the musk-ox in the corresponding gravels of the Thames Valley. Such a discovery told him, as plainly as if it had been formulated in words, that man had been alive in Southern England at a time when Arctic conditions prevailed, the ice sheet reaching as far southwards as the valley of the Thames.

III. *He sets out to gather Evidence of Man's Antiquity.*

Lubbock was a young man of twenty-six when the valley of the Somme gave him his first glimpse of the immensity of man's past. In 1861 he began to devote his times of leisure to searching Europe for evidence which would carry human history far beyond the earliest of written records and the oldest of traditions. There was no man in Europe so well qualified as he for such an undertaking. He had absorbed the teaching of Darwin, and knew that he must seek for the beginnings of humanity in the jungle and amongst beings little higher than anthropoid apes, such as the gorilla or chimpanzee. He was a trained and accomplished zoologist, accustomed to test and assort scientific evidence. He had a first-hand knowledge of the recent geological formations in which traces of man should be found—if man were indeed an ancient animal. He was familiar with the fossil remains of the beasts and birds which lived when these geological deposits were laid down, and he had studied ancient implements of stone and of metal. He was familiar with plants, and every day he rubbed shoulders with men who were professed experts on all of those special branches of knowledge which had to be utilised by the anthropologist in the course of his pursuits. He had youth on his side, a tireless industry, an active brain which, in the search for evidence, sifted the gold from the dross with the swift and sure touch of genius. "A flint flake," he declared, "is, to the antiquary, just as sure trace of Man as was the foot-print in the sand to Robinson Crusoe." Add to these qualifications the gift of marshalling his thoughts and observations in an orderly sequence and of throwing them into clear crystalline words and sentences which never leave the reader in a moment's doubt as to the author's meaning, and it becomes evident that John Lubbock was equipped beyond all his fellows for the task to which he was to put his hand. Let us have done, once and for all, with the prevalent notion that his books on the pre-history of man are the mere accomplishments of a clever compiler. He was an original thinker of a high order.

In the spring of 1861 he set out on his self-appointed task. He and his senior friend, George Busk, turned their footsteps towards Denmark—a country which, as Lubbock said, "occupies a larger place in history than on the map of Europe." Some twenty-three years before the date at which Lubbock and his friend Busk reached Denmark two of its learned inhabitants, Thomsen and Nilsson, had discovered a new way of dating man's unwritten history. From their knowledge of ancient tombs and from noting the order in which things were found when peat mosses were excavated, they had come to the conclusion that the unrecorded history of their country could be divided into three phases or periods. The first and oldest of all was a time when Danes fashioned their implements out of *stone;* this was succeeded by a period in which implements were fashioned out of *bronze;* this in turn was followed by a third period in which *iron* was the material utilised. Such was the earliest attempt to divide man's unwritten history into succeeding periods. At the time of Lubbock's arrival a small band of Danish archæologists and zoologists had just completed an investigation of those long shell-heap mounds which stretch along various parts of their coastal lands. In the heaps they had found roughly hewn and peculiarly-shaped flint implements; they found bones of many kinds of fish, bird, and beast, but only the remains of one domesticated animal—the dog. There was a difference of opinion as to whether these shell heaps (kitchen-middens) were older than the mound-tombs (or tumuli) or belonged to the same period. In company with Steenstrup, one of the excavators, Lubbock examined the chief sites at which explorations had been conducted; he became familiar with megalithic tombs and tumuli, their structure and contents; and he mastered the archæological contents of the Museum of Northern Antiquities in Copenhagen. When he returned to England he wrote for the *Natural History Review*[1]—which a company of English scientists had acquired as their organ of publication, and of which he was an editor and, as I suspect, part-proprietor—an article giving an account of what he had seen and what he had learned of the pre-history of Denmark. No one who reads this article can fail to perceive that a new master had made his appearance among English archæologists.

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[1] See Bibliography at end of this chapter.

In the following year, 1862, he went to Switzerland to study with his own eyes the very wonderful discoveries of prehistoric times which had been made there. In the spring of 1854 the Swiss lakes, owing to the nature of the season, had so dried up that great stretches of their muddy margins were exposed, and parts of these were reclaimed by the peasants. As the peasants dug and dammed, clusters of piles were discovered in the mud—the piles or posts on which lake habitations had been built. By 1862 the Swiss archæologists had observed that some of these lake-villages were older than others; in the mud around some only implements of stone were found; around others they were of bronze. The animal bones found round the sites of these ancient habitations had been studied; it was found that even the oldest settlements yielded evidence that the ox, sheep, and goat were already domesticated. Then charred, winnowed grain was found, showing that the oldest of the Swiss lake-dwellers were proficient agriculturists. Remains of buried villages, far more ancient than Pompeii, were thus unexpectedly brought to the light of day. In company with M. Morlot, one of the leading archæologists of Switzerland, Lubbock spent a month examining the village sites and the various objects of culture associated with them; he studied the objects treasured in Swiss collections and museums. He came home and wrote for the *Natural History Review* an account of all he had seen and learned. The facts, as they passed through his mind, fell into their right position in place and in time, with the result that the picture he drew was one from which the expert as well as the novice had much to learn. He placed the observations of his Danish and Swiss colleagues in their proper perspective; he saw that the oldest of the lake-dwellings were of the same age as the oldest of the Danish tumuli, and that the kitchen-middens were more ancient than either—how much older he could not estimate. In the same year (1862) he again visited the Somme Valley, inspected the gravel pits and examined the flint implements and fossil remains found in them, and then contributed a second article to the *Natural History Review* of 1862, in which he set out the conclusions he had formed concerning that remote phase of human history which had been discovered by Boucher de Perthes. He realised that the stone period as formulated by Danish archæologists must be divided into two—a very ancient, vast period, which he subsequently named *Palæolithic* or *Archéolithique,* and a more recent one, *Neolithic*, corresponding to the stone period of Denmark. He was now convinced that in the palæolithic period man had lived with animals long since extinct—the mammoth, woolly-haired rhinoceros, and hippopotamus. The stone implements of the palæolithic period were large, of peculiar forms, and of bold workmanship; the period itself was vast and remote, for the gravels were laid down long before the lower river valley of the Somme had been excavated to its present depth.

In 1863 he made a hurried visit to the south shore of the Moray Firth to examine shell-mounds which had been discovered there, and quickly convinced himself that they belonged to a much later date than those he had seen in Denmark. He made another excursion to Denmark in company with Mrs. Lubbock to extend and verify his former observations; he again visited the Swiss lake-dwellings, this time in the company of two friends, Tyndall of the Royal Institution, and Huxley of the School of Mines. He gave an Evening Discourse at the Royal Institution (which he had joined at the age of fifteen) on his Swiss trip, much to Professor Tyndall's satisfaction—and Tyndall was a hard judge of lecturers.

But the chief event of this year (1863) was his excursion into American archæology. He perceived, as Worsaae, the Danish archæologist, had done before him, that if we moderns are to understand the significance of a stone age we must first study living peoples who are still stone-users. The American Indians, both ancient and modern, seemed to Lubbock the most likely to yield him the guidance he sought for. Hence in this year we find him absorbing recent works on American archæology and dealing with them most ably in the *Natural History Review*. It was while thus engaged that he realised the complexity of the task he had undertaken; he had to explain not only the origin of man's dwellings, weapons, clothes, and methods of gaining a livelihood, but also those institutions and customs of which we are almost unconscious of their having a beginning, because we have been familiar with them from birth onwards—marriage, religion, laws, and blood-relationships.

In the year following (1864) we find him giving his particular attention to still another phase of the history of ancient man. At this time archæologists were just beginning to perceive that some of the most important documents relating to the evolution of man and of his civilisation were to be found in the *débris* trampled down under foot on the heaped-up floors of caves. We have already alluded to the discovery made in the cave at Brixham in 1858, and we might also have mentioned similar observations which had been made in Kent's Cavern, a neighbouring cave, near Torquay. It was discoveries made in South-West France, however, particularly along tributaries of the Garonne and Dordogne, which revealed the archæological wealth stored away in caves and rock-shelters. In 1860 Édouard Lartet, who was among the first to recognise the importance of Boucher de Perthes' discoveries, was passing through the village of Aurignac, situated on a northern shoulder of the Pyrenees, and stopped there a day or two to examine a cave which had been discovered some years before the date of his visit. On digging into the floor of this cave near Aurignac, Lartet found flint implements mingled with the remains of extinct animals, both sorts being scattered amongst hearths on which cave-man had lit his fires and done his cooking. Thereafter Lartet extended his explorations to caves along the cliff-set banks of the Vézère, a tributary of the Dordogne, his researches being facilitated by the aid of an Englishman of means and also a distinguished archæologist, Henry Christy, who had joined Lartet as a partner in the great adventure of cave-exploration. In the spring of 1864 John Lubbock went to the Dordogne to examine the surprising discoveries which were being made in the caves along the Vézère by his friends, Lartet and Christy. He saw the remains of the extinct animals which were being found; such were of particular interest to him, for he had become an expert student of the fauna amidst which ancient man had lived and hunted. Lartet had worked out a scheme for determining the relative antiquity of caves as human habitations by the kind of extinct animals represented by the fossil bones in their floors. Lubbock examined the implements which had been unearthed and saw that some caves yielded types which were more primitive and older than those found in other caves. He perceived, for instance, that those from the famous shelter at Le Moustier were akin to certain types found in the gravel terraces of the Somme, while implements from other caves fell towards neolithic types. He saw that the human records to be found in French caves filled up the great blank which lay between the older implements of the valley gravels or drift and the much later records of the Danish shell-heaps and tumuli. He recognised that a type of implement, which had been found in several places in England, showed the same art of workmanship as those discovered at Le Moustier in France. What surprised Lubbock most on this visit was the clear evidence, provided by the collections of Lartet and Christy, that the Cave-men of the Dordogne were artists of a high order. He had never seen in the pottery or implements of Neolithic man any manifestation of an ability to depict living forms of animals; if they decorated at all they had adopted designs of a geometrical order. Here, however, were cave-men, infinitely older than the neolithic people, carving on bone and ivory realistic outlines of reindeer, horses, and mammoths in action.

He returned to England and contributed articles to the *Natural History Review* on the various species of European animals, extinct as well as living, whose remains had been found associated with human artefacts of the French caves. He also set in order and issued in the same volume of the *Natural History Review* all the facts he had observed, and the conclusions he had drawn from his own studies of cave-exploration and from the documents which had been supplied to him by others. These articles were recognised by his contemporaries as sources of authoritative information.

IV. *He writes "Prehistoric Times."*

The papers which he contributed to the *Natural History Review* proved highly popular; there was a demand for them at home and abroad. Having undertaken in the summer of 1864, at the suggestion of his friend Professor Tyndall, to give a series of lectures at the Royal Institution on "The Antiquity of Man," he had occasion to re-arrange in a more consecutive form all the evidence he had gathered relating to this problem. Then, at the request of Messrs. Williams & Norgate, he threw his evidence into the form of a book, choosing for it the happy title of "Prehistoric Times."

The book was issued early in 1865, the year in which his father died, leaving him heir to the family baronetcy. The preface is dated February 1865, and was written from Chislehurst, his home at this time. I shall have occasion later to note the changes which he effected in its matter as new editions were called for up to the seventh and last, issued just after his death in 1913. There is, however, one aspect of this work which I would touch on now. We see in it a full manifestation of his supreme gifts as an expositor; he took the utmost pains to make his meaning clear. He was not content to appeal merely to the narrow and limited audience of experts, although he had much that was both new and important to tell them. He believed, and he also proved, that it is possible to set forth a scientific problem, of a new kind and founded on technical evidence, in such a way that the public itself may become a jury and give a just verdict. Science, he held, was for public as well as for laboratory consumption. But it is just this aim—that of a high educationist—which has misled a later generation into supposing that John Lubbock of 1865 was a mere popular expositor. From the records here set out it will be seen that he had mastered the evidence relating to man's early history more fully, and drawn his conclusions with greater intuition, than any of his contemporaries. This is why "Prehistoric Times," amidst the avalanche of archæological discovery which started to descend on the scientific world after its publication, required very little alteration to keep the status of a standard work.

Further, we have to remember that in 1865 the new Anthropology—the doctrine of Man's great antiquity, was looked on with the greatest suspicion by both Church and State. He stood for Parliament just as "Prehistoric Times" was published, and the appearance of the book cost him many votes. Huxley met the full brunt of this popular opposition in 1863, when he set "Man's Place in Nature" before the British public. Huxley's way was to beat the truth into his opponents and critics without mercy; like a wilful physician he seized recalcitrant patients by the nose and forced his medicine down their throats; such treatment, he was convinced, was for their good and serviceable for the advance of truth. Lubbock's methods were the reverse; he allayed prejudice in advance by dressing his unwelcome facts in the apparel and charm of reason; he was ever the courteous physician who knew how to tempt patients to swallow the medicine which would otherwise prove repulsive and unpalatable. This manner was native to him, but it had been strengthened by his exemplar, Darwin, who, patiently setting forth his facts, left their effect to sink into the mind of his readers. We shall see that in his later years Lord Avebury's patience became less elastic. The even surface of his temper did occasionally become a little ruffled by the breath of critics and commentators, but even at such times his inborn courtesy never lost its sway for a moment.

V. *The Inception of "The Origin of Civilisation."*

The greater part of "Prehistoric Times" was made up by the chapters which, as we have seen, were gathered in Denmark, Switzerland, France, and England; but there were added three chapters devoted to the customs and beliefs of primitive races—peoples who were in reality still living in the stone period. Also a remarkable last chapter in which the author summed up his final conclusions concerning the origin of Man and of his Civilisation. In particular he emphasised the misery of savagedom and the blessings of civilisation. Darwin, when the work appeared in 1865, laid his unerring finger on the strongest part of the book, the final chapter. "I cannot resist telling you how excellently well in my opinion," Darwin wrote to him, "you have done the very interesting chapters on Savage Life . . . but I ought to keep the term original for your last chapter, which has struck me as an admirable and profound discussion. It has quite delighted me, for now the public will see what kind of man you are, which I am proud to think I discovered a dozen years ago." These closing chapters on savage life, particularly the final one, contained subjects which were now to engross his attention. In the following five years, up to 1870, he kept searching the records of travellers and of anthropologists for information concerning all living primitive races of mankind—particularly facts concerning marriage, religion, and morality—indeed, all those beliefs and customs which lie deep in man's heart, swaddled in passion and in prejudice—the most delicate of all human possessions for the man of science to touch. We shall find Sir John Lubbock in "The Origin of Civilisation" picking his way along the road of truth without enraging the Image-breakers or upsetting the High Priests.

VI. *As a Leader among Ethnologists and Anthropologists.*

Before we follow the preparations made for "The Origin of Civilisation" we must turn aside for a time and note the efforts which Sir John Lubbock made to strengthen the Ethnological Society and to start the Anthropological Institute of Great Britain and Ireland on its career of usefulness. In 1863 the Ethnological Society had been in existence for twenty years. It met in a building behind the National Gallery, now cleared away, its site being to-day marked by Irving's statue. The men who composed the Society were eminent travellers, retired colonial servants, and elderly medical practitioners. They were men who held "views" and who rarely undertook a systematic examination of any problem or set out on an orderly search for evidence relating to the subjects which were discussed at the Society's meetings. They were debaters, but one young member—James Hunt—fired with an expansive enthusiasm for the newer forms of Anthropology, began to give the senior and saner members of the Society an uncomfortable time. He left the Ethnological and founded a new Society—the Anthropological. Certain members of the elder Society bestirred themselves—particularly those of a scientific turn of mind, who had accepted the teaching of Darwin (Henry Christy, John Evans, George Busk, Clements Markham, Russel Wallace), and induced Lubbock, and then Huxley, to join the Ethnological Society. Lubbock joined on January 13th, 1863, and in the following May was elected President. Galton became Secretary, but Lubbock needed the support of all his friends—Busk, Evans, Christy, Huxley, and Roderick Murchison—to sit quietly in the presidential chair and listen to Sir Samuel Baker, the veteran African traveller, assuming as a matter beyond question that man was fashioned in the year 4004 B.C., and to hear a former secretary of the Society assuring its members that the only users of bronze implements who had ever been in England were the Romans. It was the same gentleman who asserted that there was no clear evidence of there having ever been a "stone period" in the prehistory of Europe. Still, many excellent contributions were made to the Society during the two years Lubbock occupied its chair. A great deal of instructive and systematic research on the ancient tombs of Great Britain was carried out by several archæologists—in particular, by Lubbock's friend, Dr. John Thurnam, superintendent of the Wilts County Asylum.

The two years (1863–64, 1864–65) during which Lubbock was President of the Ethnological Society mark a period in which British workers may take a legitimate pride. It was at this time that the great work on ancient British skulls by Barnard Davis and Thurnam appeared. Bateman's researches among the ancient tombs of Staffordshire and Derbyshire, in which Lubbock was closely interested, were finished; those on the tumular tombs of Yorkshire by Canon Greenwell and Rolleston were begun. We may see how high Sir John Lubbock's reputation among European archæologists and anthropologists stood at this time, for three years after he left the chair of the Ethnological Society he was the British representative who was chosen to preside over the deliberations of the International Congress of Prehistoric Archæology and Anthropology when this body met in Norwich during the autumn of 1868. It is worthy of notice that this Association was founded in 1864 by Gabriel de Mortillet; just before the Congress met at Norwich, de Mortillet propounded his scheme of sub-dividing the great palæolithic epoch into a series of periods or sections, each section being recognised by the fashion in which its stone implements were worked. This classification has been adopted and extended by subsequent generations of workers, but the scheme was one which never received Sir John Lubbock's full approval.

It was at this period, too—in the later 'sixties—that a new master appeared in the ranks of British anthropologists and became closely associated with Sir John Lubbock. General Pitt Rivers—at this time known as Col. Lane Fox—was born in 1827, and was thus Lubbock's senior by seven years. He had become an anthropologist in the most natural of ways. As an instructor in musketry at Hythe he was drawn to a study of the evolution of the musket, and from this initial study it was a natural step to enquire into the implements of warfare used by barbarous peoples in modern and ancient times. He was a student of fortifications; hence the ancient earthworks on the Wolds and Downs attracted his attention. He introduced into archæological investigations methods of precision which modern excavators may well strive to copy; they will be hard to surpass. In the later years of the Ethnological Society (1867–1870) we find him reporting his investigations on the pile-dwellings discovered at sites in the City of London near the Mansion House, his observations on British palæoliths, and interesting his fellows in the implements of primitive warfare. We shall see that, when Sir John Lubbock succeeded in passing a Bill through Parliament for the better protection of Ancient Monuments, it was General Pitt Rivers who was chosen to carry out the responsible duties of Inspector under the new Act.

We must follow the history of the Ethnological Society and of its rival, the Anthropological Society, to a crisis in their affairs at the close of 1870—again involving an appeal to Sir John Lubbock for help and guidance. The anthropological body had numbers, enthusiasm, and enterprise, but all the solid men of learning were enrolled amongst the ethnologists. The ethnologists elected Huxley as their President in 1868; and during the two years of his presidency a pacific policy was pursued so as to bring about a union. Huxley, however, had too many enemy scalps dangling from his belt to be acceptable as a plenipotentiary and peace-maker. It was not until January 1871 that, by mutual consent, it was agreed to ask Sir John Lubbock to be the first President of the two rival Societies, now to be amalgamated under the name of the Anthropological Institute of Great Britain and Ireland—the body which still prospers and has now the right to the prefix "Royal." It required all Huxley's advocacy to overcome his friend's modesty; Sir John Lubbock recognised Huxley's great ability and his just claims to the highest honours which Anthropology could bestow on him. He yielded reluctantly to the urgency of Huxley's request to take the new Presidency.

On February 14th, 1871, the united societies met, and with acclamation elected Lubbock as President; his old friend Huxley, Busk, and John Evans became Vice-Presidents, while on the Council he had the support of Lane Fox, McKenny Hughes, and Boyd Dawkins. Sir William Boyd Dawkins still remembers these stirring times, and is still as keenly interested in present-day problems of Anthropology as he was in these early days of the Institute. Sir John Lubbock held the presidential chair for two years and saw a succession of friends, all of them his seniors, take the chair he had vacated—George Busk, Lane Fox, John Evans, and Edward B. Tylor.

The subjects of his two presidential addresses show us the kind of problem which interested him at this date. In the first address he traced the evolution of our system of naming blood and marriage relationships; in the second he welcomed the appearance of a work on Ancient Stone Implements by his close friend, Sir John Evans. He held that all the various types of ancient stone implements had indeed been distinguished, but that their sequence and time periods were still unknown. He discussed favourably the possibility of man having been already evolved at so remote a date as the Miocene Period.

VII. *The Writing of "The Origin of Civilisation."*

We have seen that the preface to "Prehistoric Times" was dated Chislehurst, February 1865; he was then on the eve of his first and unsuccessful contest for a seat in Parliament. His second great work, "The Origin of Civilisation and the Primitive Condition of Man," has its preface dated exactly five years later, High Elms, February 1870, and he was on the point of another parliamentary contest—this time a successful one. We have seen that the inception of this work was already apparent in the later chapters of "Prehistoric Times." The handling of concrete facts relating to the antiquity of Man was child's play compared to the new task he had undertaken. He had now to descend into the labyrinthine recesses of the mind of Savage Man and trace, step upon step, the manner in which our beliefs, habits, customs, institutions, and modes of action had come into being. The field was one which, in 1865, had hardly been touched by the trained investigator. It was in this year (1865) that his friend Edward Burnett Tylor (1832–1917) published his "Researches into the Early History of Mankind," and almost at the same time John Ferguson McLennan (1827–1881), a Highlander practising at the Scots bar, issued his "Primitive Marriage"—showing that capture of the bride gives an important clue to the manner in which our modern marriage customs had come about. It was not until 1869 that Lewis Henry Morgan (1818–1881) published his "System of Consanguinity and Affinity," founded upon the lore of kinship he had learned while living amongst the Indians of North America. No doubt our author benefited by the observations and discoveries made by these pioneers; but, taken as a whole, the gathering of the great mass of evidence set forth in "The Origin of Civilisation," and the inferences founded on this evidence, must be regarded as an original and systematic attempt to mark out a new and important field of human knowledge.

As in the preparation of his first book, so in this, we see the kind of subject which was engrossing his leisure hours from the articles contributed to scientific gatherings in the years preceding the publication of the "Origin.' At the Meeting of the British Association at Dundee in 1867, when he stayed at Eden with his intimate friends, the Grant Duffs, he read a paper on "The Primitive Condition of Man." In the spring of 1868 he delivered at the Royal Institution a course of lectures in which he dealt with the art, language, morals, laws, religion, recognition of relationship, and marriage customs among savage peoples. In the spring of 1870 the result of ten years of study was ready for publication, and no one was more alive to the fact that this new book might well prove upsetting to many of its readers, as well as to many of his own friends, than was the author himself. The new book, however, went well; 1000 copies were printed and 725 of them were immediately sold. It went through six editions, the last appearing in 1902. A supplement, we shall see, was prepared and published in 1911.

In "The Origin of Civilisation" we find the exposition so clear and so simple that we are apt to forget that we are being put in possession of new knowledge of a recondite kind. When a work of this kind is presented in the panoply of scientific terms, as is the habit adopted by most experts, it has an appearance of great and of impressive learning. In Lubbock's hands the most abstruse problems took on an appearance of simplicity. He was keenly alive to the public importance of the subject he was handling; he clearly perceived that an Empire whose frontiers enclose, or march with, all the primitive peoples of the world, and with peoples in all stages of cultural evolution, should be familiar with the secret ways and thoughts of the savage mind if it is to succeed in holding its proud place. He knew, too, how to make unpalatable facts pleasant without injury to truth; he sought to placate his opponents before he tried to reason with them. He had the delicate subject of religion on his mind when he wrote: "I shall endeavour to avoid, as far as possible, anything which might justly give pain to any of my readers. Many ideas, however, which have been, or are, prevalent on religious matters are so utterly opposed to our own that it is impossible to discuss the subject without mentioning some things which are repugnant to our feelings. Yet . . . the religious mind cannot but feel a peculiar satisfaction in tracing up the gradual evolution of more correct ideas and of nobler creeds." Here the strict churchman is placated by the terms in which his religion is spoken of, and the author has the satisfaction of driving home the truth that the highest of religions have yet the humblest of origins.

VIII. *"The Origin of Civilisation" as a Pioneer Work.*

When we compare the first and last editions of "The Origin of Civilisation" we are surprised to find how little they differ in size and substance. New chapters had to be introduced to deal with "The Origin of Marriage" and "The Development of Relationships." When we seek to know how it was that Sir John Lubbock at one step got so near the core of truth while unravelling the history of human civilisation, we find it in his early and complete mastery of Darwin's teaching. It was no half-felt belief with him, but a visualised actuality, that man, at a very remote date, had been evolved from beings who in their outward aspect, habits, and manner of living were little higher than the gorilla and chimpanzee. When he sought to explain the evolution of marriage he began by realising the conditions of life among the primeval humanoid groups. The maternal instinct, he perceived, must certainly have been in existence from the very beginning; the mother suckled her young; but once the period of nursing was over, the child became a member of the horde, group, or tribe. The child became, as was its mother, the common property of the tribe. The child at this early stage of evolution recognised no mother, never knew a father, and was unconscious of cousinship. There was no pairing for more than a season, if for that. Then came the time, so our author supposed, when the mother began to recognise and distinguish her progeny, and the children the mother, until they reached an adult status. A further stage was when the father recognised and claimed his children and they him. Then came the final stage, when father and mother, son and daughter, mutually recognised the relationship on which each stood to the other. This was, broadly expressed, Sir John Lubbock's theory of the evolution of the family; at each stage in its development the classification of relationships had to be amended and extended. He expressed his opinion thus: "As the valves indicate the course of the blood in our veins, so do the terms applied to relationships point out the course of past history." And all his original thoughts and observations are stated in terms so impersonal that only those who know the history of the subject can recognise the many and important additions which he made to this department of our knowledge.

It was McLennan who first perceived that our modern marriage ceremonies could be explained only if we supposed there was a time in which the bridegroom had to capture his bride by force, but it was Lubbock who conceived that it was this practice which had probably brought about the custom of human beings pairing for life. In the primeval stage postulated by our author pairing was promiscuous and temporary; in a later stage women became the common property of the manhood of the tribe; in a further stage, the origin of which has not been explained, the tribe was broken up into groups or clans, the men of one group being bound to choose their wife or wives from certain other associated groups of the same tribe. If in this stage men went further afield and captured a woman from another tribe, the captive would then belong not to the community of men in the captor's clan, but to the captor alone. In this practice, so Sir John Lubbock maintained, lay the beginning of marriage; on this basis he explained why the bridegroom should placate the bride's people and at the same time avoid his mother-in-law. His theories were clearly defined and had in them a logical force. And through all his serious enquiries would creep out, as here, a gleam of humour and on rare occasions of personality. "There are," he writes in his chapter on Marriage, "scarcely any nations, whether barbarous or civilised, in which the relations of the two sexes are quite satisfactory. Savages treat their wives as slaves. . . . Civilised nations, in avoiding these excesses, too often fall into those of an opposite kind."

Of all the chapters in "The Origin of Civilisation," those on Religion take the closest hold of the reader's attention. He brought to this part of his enquiry a mind imbued with a devoutly religious upbringing—a training which might be thought to have unfitted him for such an enquiry as he now set out upon. "That there should be any races of mankind so deficient in moral feeling was altogether opposed to the preconceived ideas with which I commenced the study of savage life," he wrote, "and I arrived at the conviction by slow degrees and even with reluctance." The evidence which he collected forced him to conclude that man had started away on his evolutionary journey destitute of "moral feelings," without knowledge of right and wrong, and altogether ignorant of a deity and of the idea of a resurrection to immortality. He was driven by the hard logic of facts to accept as a final truth that the religion in which he had been nurtured was one which had been gradually shaped by human minds, and that the route by which it had reached him lay through the savage practices of fetishism and magic, totemism and ancestor worship, to the belief in, and worship of, an omnipresent Deity. Having reached this conclusion, he did not, as has happened to so many men who have gone through a similar process of education, fling religion to the dogs. "Science is still regarded," he wrote, "by many excellent, but narrow-minded persons as hostile to religious truth, while in fact she is only opposed to religious error." It needed moral courage to make this statement in the year 1870. He was not content merely to barricade the house of science from priestly attacks; he showed great daring and actually broke into the temple itself, with the sword of truth in his hand. This is a very significant fact, that Lord Avebury, with a logical mind and trained in the methods of science, could retain his religious beliefs while giving his complete adherence to the teachings of Darwin.

IX. *Lord Avebury as Antiquary.*

We have been dealing with that busy and fertile decade of Lord Avebury's life, stretching from 1860 to 1870—from his twenty-sixth to his thirty-sixth year—in which he applied the doctrine of Evolution to explain the origin of man and of his civilisation. After 1870 his energies were absorbed by other studies and by public affairs. There runs through this period of his life what may be called an antiquarian interest, the beginnings of which lie in the decade we have been surveying. On June 2nd, 1864, he was elected to that highly respectable, ably conducted, and rather exclusive body, sheltered by Government in Burlington House—the Society of Antiquaries of London. Exactly forty years later he was to become its President, a post which he occupied for four years, giving presidential addresses in 1905, 1906, 1907, and 1908. At the older period of which we speak he was interested in the early graves and tombs of Britain and in dating the implements and ornaments and pottery found in them. His attention was drawn to the Wiltshire Downs, to their tumuli, to the ancient stone monument of Stonehenge, to the still more magnificent circle of great stones at Avebury, and to the great adjoining earth mound—Silbury Hill. James Fergusson, who was the leading authority on ancient monuments in these early days, had assigned all of the Wilts memorials just mentioned to a post-Roman date, under the belief that Silbury Hill was built over an old Roman road. In 1866 Sir John Lubbock made a careful survey of the site and proved by excavations that the Roman road diverged as it reached Silbury Hill, and that the Hill was erected long before the time of the Romans, and that the available evidence pointed to Stonehenge as a monument of the Bronze Age, while Avebury was still older. In 1865 he wrote of Avebury Circle: "On the whole this appears to have been the finest megalithic ruin in Europe, but unfortunately for us the pretty little village of Avebury, like some beautiful parasite, has grown up at the expense and in the midst of the ancient temple."

And so it came about in 1871, after he had taken his seat in Parliament, and was meditating as to how the State could step in and save our ancient monuments, a national heritage, from utter and complete destruction, he received an urgent message from Mr. Bryan King, the rector of Avebury, telling him that the site of the circle was to be used for building purposes. Sir John Lubbock, fortunately for us, could act as well as write and speak; he put his hand in his pocket, became the owner of the site, and thus justly acquired the right to take Avebury as his title. It was such dangers as these that urged him on to claim the protection of the State for Ancient Monuments. He and his contemporaries had seen stone circle after stone circle, megalithic tombs and ancient earth works, blasted, quarried, carted away to make room for the plough or to supply material for new buildings. He introduced his first Bill for the Preservation of Ancient Monuments in 1873, but it was not until 1882, after nine years of constant pressure and infinite diplomacy, that he overcame the apathy of most, and the antipathy of a few, by getting a partial measure of protection enacted. We have already mentioned that his friend General Pitt Rivers took over the duty of serving as inspector under the new Act. At later dates we still find Lord Avebury interested in Stonehenge and Avebury. In 1901 he consulted Sir Norman Lockyer as to how far astronomical data could throw light on the age of Stonehenge, and in 1904 he followed with close interest the excavation of the great enclosing ditch at Avebury. He had the satisfaction of finding that the evidence thus obtained supported the conclusions he had formed at an early date.

In 1864, when Lubbock joined the Society of Antiquaries, there were many of its fellows who still believed that bronze implements were of Roman origin. He, in conjunction with his brother Frederick, did much to convince the antiquarians of England that the use of bronze was spread throughout the North West of Europe centuries before the rise of Rome. Then in 1866 his attention was drawn to one of the most instructive cemeteries ever discovered in Europe—at Hallstatt, Salzburg, in the eastern outliers of the Austrian Alps. Here, as we now know, a community of people traded in salt, derived from the local mines, about 1000 B.C., just when iron began to replace bronze as the most serviceable metal for man's multifarious needs. In 1846, when the mines were worked under the Austrian Government, the ancient burials and cremations of Hallstatt began to be exposed, and a more or less systematic record was kept of the finds as they turned up. In the spring of 1866 Sir John Lubbock, in company with his friend John Evans, set out for Vienna, and on their way home visited Hallstatt, examined the site of the discoveries, and arranged with Georg Ramsauer, the Director of the Mines, to have further excavations carried out at their expense. Thus it happened that, in 1869, Sir John Lubbock became the owner of very fine samples of the artistic implements, ornaments, and utensils used by the ancient saltworkers of the centre of Europe. These, with stone and bronze collections made at various times, adorned the walls of the hall at High Elms. In adding to his collection he had the advantage of the skilled advice of his friend Sir A. Wollaston Franks, Keeper of the Department of British and Mediæval Antiquities in the British Museum, and of Sir Wollaston's successor, Sir C. Hercules Read, who, but for the condition of his health, would have done a fuller meed of justice to Lord Avebury's memory than the present writer is qualified to do. In 1916 the second Lord Avebury presented the Hallstatt collection at High Elms to the British Museum. This valuable gift has been described in *Archæologia*, 1916, Vol. LXVII, p. 145, by Sir C. Hercules Read and Mr. Reginald Smith. This Hallstatt incident is an example of the unerring judgment with which Lord Avebury picked out the really important discoveries in Archæology.

We can but mention his visit to Italy in 1868 and his description of a peculiar kind of bronze urn—the "Hut-Urn"—from an ancient cemetery at Marino—described in conjunction with Prof. Pigorini. We can only allude to his journey down the Danube with a merry company in 1872, the weeks he spent examining Schliemann's investigations of the site of Troy, his correspondence with that pioneer, and the examination of the mound-tombs on the plain of Troy. All added to his stock of knowledge needed for new editions of his two great works.

In this Antiquarian series must also be included his "Short History of Coins and Currency," which like his greater works sprang out of a subject first made public in lecture form. "This little book," he writes in the preface, "is founded on an introductory address, given as first President of the Institute of Bankers." It was rewritten in 1901 as a lecture for the London Institution, and then, at the suggestion of Sir Philip Magnus, was published as a book in 1902, in Mr. Murray's Home and School Library. We who have been accustomed to the use of money from childhood are surprised to find that coins and currency first came into use less than 3000 years ago. But even Lord Avebury, banker as he was, found it hard to trace the evolution of currency from the older practice of barter.

X. *Some Ideas which were peculiarly His Own.*

With the visit to Troy Sir John Lubbock's career as a worker in the field of Anthropology may be said to have come to an end. His interests remained alive in all that was being done; he noted all that passed in the societies with which he had been and still continued to be associated. We may now turn our attention to certain important conceptions to which he gave life and shape. One of his theories, which is now being actively combated, may be described under the name of "Independence of Origin." Throughout "Prehistoric Times" and in "The Origin of Civilisation" we come across the statement of this idea time after time, but he gives his belief the most detailed expression in the concluding chapter of the first edition of "Prehistoric Times": "I have already expressed my belief that the simple arts and implements have been independently invented by various tribes and in various parts of the world." Or again, in Chapter VI (Religion), "Origin of Civilisation": "So that, as I shall attempt to show, races in a similar state of mental development, however distinct their origin may be, and however distant the regions they inhabit, have very similar religious conceptions." This, I believe, was then a new doctrine. James Fergusson, in discussing the origin of ancient stone monuments, concluded that the practice which led to their erection must have spread from one centre. Morgan, when he found the same system of classifying relations among the native peoples of India and of America, inferred that the American Indians had derived their knowledge from India. Prof. E. B. Tylor, too, in his earlier works, invoked contact or migration to explain identity of custom, but later he accepted Lubbock's "Independence of Origin" theory. In coming to the belief which he held so definitely and strongly one infers that Sir John Lubbock must have been greatly influenced by the similarity of instinctive actions which he observed to be manifested by diverse and widely separated groups of animals. At the time at which he wrote it was not recognised that man's evolution has been in the direction of destroying all inherited instincts and replacing them by more or less acquired or voluntary actions. At the present time Prof. Elliot Smith is strenuously advocating, and supporting with evidence, the older conception that the existence of similar practice and custom in widely separated regions of the world is nearly in every instance to be explained by the borrowing or spreading of the custom from the one centre of its origin or evolution.

One other idea which Lord Avebury deserves to have ascribed to him is that "progress in civilisation means increased happiness for mankind." In the days of his youth, and long before he was born, the statement had been made, and very likely will be repeated long after we who are living have gone the way of all flesh, that the primitive mode of living as seen among uncultured peoples is the happiest of all human forms of existence. Civilisation, it is said, brings cares without any compensations. "Those who have *not* devoted much attention to the subject," Sir John Lubbock wrote, "have generally regarded the savage as having one advantage at least over civilised man; that, namely, of enjoying an amount of personal freedom greater than that of individuals belonging to more civilised communities. There cannot be a greater mistake; the savage is nowhere free" ("The

Origin of Civilisation," 5th ed., p. 450). Nor had he any difficulty in proving that his contention was true in its bearings on all sides of human life.

Allied to this contention was another prevalent belief he sought to dissipate. It was still widely held in the middle decades of last century that savage and primitive races were the progeny of higher races who had fallen away and degenerated when extruded from the pale of civilisation. Sir John Lubbock found no evidence in the language, customs, and beliefs of primitive peoples to support the theory of their origin by degradation; the mass of evidence he gathered went to show that all the races of mankind, even the most primitive, were climbing up the evolutionary ladder which leads to civilisation, although the rate of ascent in some remained almost at a standstill. It was a doctrine which appealed to his optimistic nature and, no doubt, is true for the greater part. And yet the late Dr. Rivers could cite, especially from the Pacific Islands, instances where retrogression had set in, and communities where despair had sapped the healthy instinct to live and procreate. It was the denial of the doctrine of degradation before an audience at the British Association in 1869 which brought the combative Duke of Argyll on Sir John Lubbock's track.

We need not stay now to note various occasions in which the evolution and distribution of human races engaged his attention. He realised how impossible it was to explain the distribution of human races, as we see them to-day, on the still fashionable doctrine of hurried migrations made in mass, with sword in hand. When the first demands were made for Home Rule in Ireland, on the grounds that the inhabitants of Ireland formed a separate race, he had no difficulty in showing that the racial elements represented in that island are also represented in Scotland, Wales, and England (*Journal Anthrop. Instit.* 1887, Vol. 16, p. 418). The demand for

Home Rule could not be justly made on the grounds that the Irish were racially distinct from other British nationalities.

XI. *Final Phases and Conclusions.*

And so we come to the year 1911, when Lord Avebury, a veteran anthropologist in his seventy-seventh year, returned to the scene of his early labours. A new and active generation who pursued with accuracy and zeal the study of folk lore, religions, and magical customs had arisen; many of them had been trained under Sir Edward B. Tylor, and were systematically studying the field of which Lord Avebury had made a preliminary survey forty years previously. He found himself as one who has returned to his native town to find the house he had built occupied by strangers, the paths which he had helped to make trod by other and unknown feet, and the streets he had mapped out occupied by a throng that passed him by without recognition. In the book which he published in 1911, "Marriage, Totemism, and Religion," in reality a supplement to his "Origin of Civilisation," there is a note of assertiveness, of combativeness, and of pensiveness altogether foreign to the buoyant hopefulness and impersonality of his earlier writings. The spirit of true courtesy is still there. He finds that his theories relating to the origin of Religion and of Marriage are being misunderstood by some, neglected by some, and adopted without acknowledgment by others. In this Lord Avebury was but feeling the pangs which must beset the pioneer who reaches veteran years; it is so hard to acquiesce in the fate that sooner or later overtakes all discoveries; all, even the most wide-reaching, in the course of time become nameless and are drawn into the anonymous stock of common knowledge. His final answer to his critics was this: "I submit then that if some of the suggestions I threw out and the opinions

I expressed in my early works have been criticised by great authorities, I am able to show that they are supported by others, and what, of course, is of even more importance, they are in accordance with facts." If his ship had to be sunk it was to go down with his colours still flying. He never feared to reach a definite decision; he never "hedged."

Anthropology occupied the busy years of his early manhood, and it still remained a real source of interest to him in his old age. Even in the opening months of 1913, which were destined to be his last, and while in his seventy-ninth year, he spent his days in the preparation of the last (seventh) edition of "Prehistoric Times." On February 22nd, 1913, he attended a meeting of the Trustees of the British Museum and saw the fossil remains of that very primitive Englishman which Mr. Charles Dawson had discovered in a gravel dump and pit at Piltdown in Sussex. His evolutionary outlook permitted him to place it without effort in the scale of man's ancestry; and in his new edition he described it "as the most ape-like of all, save Pithecanthropus"—the fossil-man of Java. We find, too, from his last edition of "Prehistoric Times" that he had followed with discrimination the discoveries which had been made by Mr. Reid Moir of humanly worked stone implements under the Red Crag of Suffolk, showing that man was alive in England during Pliocene times. His early belief in the great antiquity of man was justified by the discovery of fresh evidence as years went on. And yet there were certain ideas, widely and rightly accepted, which he found hard to adopt. Even in 1913, as in 1867, he declared it was still premature to classify cave implements according to the scheme first formulated by Gabriel de Mortillet.

If I had to emphasise one part of Lord Avebury's teaching more than another I should choose that contained in the concluding paragraph of his first edition of "The Origin of Civilisation": "On the other hand, if the past has been one of progress, we may fairly hope that the future will be so also, that the blessings of civilisation will not only be extended to other countries and to other nations, but even in our own land they will be rendered more general and more equable." Herein we have a message of hope written by the pen of a great and cultured Victorian.

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V

GEOLOGY

By Dr. A. Smith Woodward, LL.D., F.R.S., Past-President of the Geological Society.

Lord Avebury's attention seems to have been first attracted to Geology by his search for the stone implements of Prehistoric Man in the river-deposits of south-eastern England. When a river gradually deepens the valley through which it flows, it leaves behind at different levels portions of its old bed covered with gravel, sand, and clay. In these "terraces," as they are termed, are often buried traces of man and the various animals which lived in the neighbourhood at the time they were formed. In them there also often occur pebbles of rocks which are no longer passed through by the river and indicate that in some way it has changed its course. The higher "terraces" are obviously the older, those nearest the level of the existing stream the latest. Other deposits of gravel above the level of the existing valleys—the so-called "plateau gravels"—obviously belong to an earlier time still, before the existing river-systems had come into being. John Lubbock, as he then was, associated himself with Lyell, Prestwich, and other senior geologists, who were at that time trying to determine the relative age of these various deposits which contained the stone implements of man beside the bones and teeth of mammals, and, though he published scarcely any of the results himself, he took a very active share in their work.

While occupied with these geological researches in Berkshire in the summer of 1855, he was accompanied by his friend, the Rev. Charles Kingsley. Following the advice of Prestwich, he paid special attention to a large gravel pit in the Thames Valley near Maidenhead railway station, which had not hitherto yielded any animal remains. Here he made a most important discovery, a well-preserved portion of the skull of a musk-ox. Remains of the reindeer and the mammoth were already well known in southern England, pointing to the Arctic condition of this part of the world when some of the old river-deposits were formed. The musk-ox, however, now restricted to North Grinnell Land, proved to be a more typically Arctic animal than any of which the remains had previously been found in England. The specimen was studied by Prof. Owen, who communicated a description of it to the Geological Society, and concluded that it probably belonged to the same species (*Ovibos moschatus*) as that still surviving in the north. At a later date Lubbock was so fortunate as to find another piece of a skull of the same animal in a Thames deposit at Green Street Green in Kent; and since that time other characteristic remains have been met with not only in the valley of the Thames, but also in the valleys of the Severn and the Wiltshire Avon. Remains of the musk-ox, with those of the reindeer, have also been discovered on the continent as far south as the Pyrenees.

When Lubbock began his examination of the river-deposits it was already known that they dated back to a "Glacial Period" or "ice age," during part at least of which Britain was covered with an ice-sheet, like that of present-day Greenland, as far south as the valley of the Thames. The clays of the lowlands full of transported stones, and the smoothed and scratched rock-surfaces in the highlands, with numerous transported blocks or boulders, had been described as ample proof of this. His enquiring spirit soon led him to examine some of the evidence, and he made many excursions for the purpose. His only publication on the subject, however, was a paper read before the Geological Society in 1867, which discussed the explanation of the well-known "parallel roads" of Glen Roy in Scotland. It was already agreed that these curious horizontal terraces marked the successive levels of a temporary lake which had been dammed up by ice during the Glacial Period, corresponding with the glacier lakes which can still be seen in Switzerland. Lubbock showed that the terraces could not be described as beaches, but were due to the rearrangement at the water's edge of the *débris* (or "talus") which already existed on the slopes of the valley before the lake was formed.

This interest in glacial geology acquired at home added zest to Lubbock's frequent holidays in Switzerland, where he could study not only the results of the former action of snow and ice during the Glacial Period or Great Ice Age, but also their actual work in the high snowfields and glaciers to which they have now shrunk. His first visit to the Alps was with Tyndall and Huxley in 1861, and he made many excursions with Tyndall when the latter was collecting material for his classical work on "The Forms of Water." He was, indeed, almost always in the company of geologists and others who were making a special study of the country, and, though he never prepared any technical papers on the results himself, he helped research as a sympathetic and discerning critic in discussions with his associates. When, therefore, Lubbock published his useful handbook to "The Scenery of Switzerland" in 1896, he produced much more than a compendium or abstract of the works of the Swiss geologists which he quoted. He wrote most of it from personal knowledge, and much from information which he had acquired when accompanying the authors to whom he expresses his indebtedness.

"The Scenery of Switzerland" is written in Lubbock's fascinating style, adapted to the comprehension of the layman in science, and it has added to the delight of many a Swiss holiday. It deals not only with the surface features, but also with the inner structure of the country, and forms an admirable introduction to practical geology.

To one who comes fresh from the study of the surface deposits of Great Britain, Switzerland is specially interesting as confirming the idea that the Great Ice Age was not a single hard episode in this part of the world, but was interrupted by more than one mild interval. James Geikie and others arrived at this conclusion from observing fossil plants of Temperate species in deposits intercalated between the boulder clays in Scotland. Lubbock accompanied Morlot when he had discovered and was examining similar deposits in Switzerland, proving the alternate extensions and retreats of the ice which formerly spread from the central heights of the Alps. In his book he mentions particularly that "at several places in the Canton of Zürich there are beds of lignite sufficiently thick to have been worked for fuel. They are intercalated between glacial deposits; they indicate a luxuriant vegetation; they contain, moreover, remains of animals, such as the Hippopotamus, which could not support great cold." Such intercalations can be explained only by fluctuations in the severity of the climate when the deposits were formed.

The rivers and lakes of Switzerland, when examined under the guidance of Lubbock's handbook, prove equally interesting. Many of the gorges must have been cut by the rivers which flow down them when the Alps were being raised into a mountain mass. They could not have originated under existing circumstances. Many of the rivers have changed their course, sometimes tapping new sources, sometimes losing part of their supply during the natural wearing down of the country by weathering and erosion. Others may have been affected by earth movements. Most of the larger lakes, indeed, seem to have originated by the tilting of the ground which has caused river valleys to be "drowned." All these questions are discussed with concrete examples and explanatory diagrams in Lubbock's book, and they can readily be appreciated by anyone who will use it on the spot.

Like all other mountainous regions, the Alps originated not by direct upheaval, but as a wrinkle in the earth's crust caused by lateral pressure. The rocks are thus extremely folded: indeed, "it has been calculated that the strata between Basle and Milan, a distance of about 130 miles, would, if extended horizontally, occupy 200. There has consequently been a shortening of no less than 70 miles." If, as is generally believed, the pressure which caused this folding was due to the cooling and contraction of the globe leading to subsidence, it must have been exerted from all sides. Lubbock seems to have been the first to appreciate the evidence for this truth in his popular volume on "The Beauties of Nature" in 1892. Bonney had already pointed out that, in addition to the long curving folds which extend in the general N.E. and S.W. direction of the Alpine chain, smaller cross folding could be observed. As in other mountainous regions, indeed, there is in the Alps a tendency towards a splitting up of the rock-masses into square blocks. Lubbock interpreted this arrangement as meaning that in the region of Switzerland the pressure which caused the folding, though most powerful in a north and south direction, was also exerted at right angles to this.

Long afterwards, in 1903–1905, Lord Avebury (as he had then become) made some ingenious experiments to test this idea, and communicated his results to the Geological Society, which published them in its *Quarterly Journal.* Many experiments to illustrate mountain building had been made by previous observers, but they had used compression only from two sides. Lord Avebury, with the help of Mr. Horace Darwin, now devised an apparatus which would exert pressure in two directions at right angles to each other. It consisted of four square beams of wood, resting on a floor, which by means of screws could be moved nearer to, or farther from, each other. The beams left between them a space two feet square and nine inches deep. At first, pieces of carpet baize were placed in the apparatus, each separated from the other by a layer of sand one and a half inches deep. The uppermost baize was also covered with a layer of sand, and about an inch above this was a piece of plate glass weighted down. Compression in both directions was then exerted, until the top layer of sand reached the glass and was flattened out. Each layer of baize was then carefully uncovered in succession, and a plaster cast of its wrinkled state was taken to make a permanent record of it. The series of casts was then ready for study. One of the upper layers of the very pliant baize showed two main lines of elevation, one running from each corner and thus crossing at right-angles. The intervening winding ridges were rounded and not very deep. The lowest layers exhibited the sharpest and deepest crumpling. When they were exhibited to the Geological Society, Mr. Hudleston remarked that the foldings in the baize corresponded exactly with those of the rocks in the mountain ranges with which he was acquainted, the folds at the base being always sharper and more intense than those in the heights. Subsequent experiments with harder materials showed the same accentuation of the folds in the lower layers, and exhibited still more clearly the tendency of the folds to be arranged at right angles to each other. The most important of the plaster casts were presented by Lord Avebury to the British Museum (Natural History), where they are now exhibited in a convenient frame.

As a sequel to his work on Switzerland, Lord Avebury published in 1902 a beautifully illustrated volume on "The Scenery of England and the Causes to Which it is Due." This again, though quoting "authorities," is very largely based on personal observation, and it is full of interesting out-of-the-way facts which are otherwise accessible only to readers of technical memoirs. The chapter on the general configuration of Great Britain is an especially able synopsis of the whole subject. It is striking to reflect that "the present western shore of Britain, and indeed of Europe, represents, so to say, a merely temporary and incidental condition." The British Isles stand on a slightly submerged platform, and the real edge of the European continent follows a line about fifty miles west of the Irish coast, where the sea-bottom suddenly plunges in a deep slope to the abyss of the ocean. The dry land was probably thus extended at so recent a geological period as the Great Ice Age. Its present outline is due to later subsidence, and, although there seems to have been no change in elevation since the dawn of history in this part of the world, it is a distinctly unstable region. There are raised beaches on the coast indicating comparatively recent elevation; there are also submerged forests on the shores indicating still more recent depression. As Lord Avebury remarks, this is a serious consideration. "A vast area of the richest and most populated portions of the globe is indeed only 50 to 100 feet above the sea-level. In our own country a subsidence of even less than 100 feet would submerge all the lower parts of London, Liverpool, Bristol, Newcastle, Hull, Cardiff, Southampton, Portsmouth, Chichester, etc., and would carry the sea up into the heart of the country."

Great Britain has no prominent mountain ranges: it shows only the worn-down bases of mountains in such districts as the Scottish Highlands, Cumberland, Wales, the Wrekin, and Cornwall. Lord Avebury, however, emphasises the fact that the predominant lines of fracture and dislocation in this country are, as usual, almost at right angles to each other, one extending from north-east to south-west, the other from north-west to south-east. He points out that these lines have much more effect on the geography of the country than is commonly supposed. The Great Glen of Scotland—the deep valley in which the Caledonian Canal has been made—follows the first of these lines; and many other depressions in Scotland are extended in the same direction. The Menai Straits, the Cheviot and Chiltern Hills may be mentioned among important features similarly disposed further south. The depressions running at right angles, namely from north-west to south-east, are best marked by several lochs in Scotland; but they are traceable again in such features as the Upper Severn, the Wye, some tributaries of the Thames, and Southampton Water in England. "The intersections of the two main lines also explain certain features in our river courses which would otherwise be inexplicable. Where the surface of the country is flat or presents a uniform slope, rivers run in curves. . . . In many cases, however, we find that they suddenly turn at, or nearly at, a right angle." This turn is to be regarded as often due to deflection by the fundamental fold or fracture crossing that which was followed in the upper part of the river's course.

Lord Avebury's chapters on the English rivers are also remarkable for numerous critical observations and various striking explanatory diagrams. While exhaustive in quotation and comparing differences of opinion, he uses his own judgment in stating each case; and one who desired to undertake research in this subject could not find a more useful and inspiring introduction to it than that here provided.

"The Scenery of England," which, like all Lord Avebury's books, passed through several editions, was his last geological work. He began his career just after the "heroic age" of Geology during which the foundations of the science were laid. Darwin, Lyell, Murchison, and Sedgwick—survivors of the pioneers—were still in full activity. Most of them were amateurs, either busy with other occupations, like Lubbock himself, or living on their own estates. They were followed by similar amateurs, such as Scrope, Prestwich, Falconer, Busk, John Evans, Sorby, and Hudleston. With most of them Lubbock was intimately associated in their researches. In later years he saw the gradually wider recognition of Geology by the universities, colleges, and Government departments, giving rise to a professional class which eventually took the lead. To these also he proved a valued colleague in the promotion of their science. Lord Avebury, however, to the end took the broader view of geology in which he was originally initiated. He could extract from technical papers just the essence that was needed to illuminate the wider problems. He could place the results before the thinking and educated public with the captivating charm which arrested their attention. He not only played his part as a promoter of research, but attracted to geological science a wide circle of enlightened sympathisers who could foster it in many ways.

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VI

ZOOLOGY (*ANIMAL BEHAVIOUR*)

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One of the most fascinating departments of Zoology is the study of animal behaviour, and Lord Avebury was one of the pioneers in making the study scientific. This requires a little explanation. If we go back to the first half of the eighteenth century, we find Réaumur's famous studies on insects—a great book in six volumes, full of intimate and accurate observations on structure, habits, and life-histories. Réaumur stands head and shoulders above all but a few; and why? Because he had remarkable clarity and precision, and the kind of mind that did not mix up reflections with observations. For that has always been the difficulty in regard to animal behaviour, that those who studied the ways of living creatures did not adequately understand the necessity for what may be called "scientific detachment." We must put on record what actually happens, without reading into it our interpretation of what it means, or of what may be going on inside the animal's head. The time for that comes later.

Now one of the steps Lord Avebury took, especially in regard to ants, bees, and wasps, was to get rid of the personal equation; and the way out, as he showed, is to pass from observation to experiment. Exact science is impersonal, but when we are dealing with living creatures this ideal is not very easily attained.

In the second place, when interpretations insinuate themselves into descriptions, or when science passes, as it must, from facts to formulæ or laws, much will depend on the mental framework of the observer. Is he inclined to regard animals as small editions of himself, or is he inclined to liken them to clockwork mice which behave as they do because of some mysterious constitutional winding-up?

As we have said elsewhere,[1] "in old days the interpretation that was put on a piece of animal behaviour was very largely dependent on the observer's temperament. If he was generous, and what William James called tender-minded, he read the man into the beast without hindrance. Every mammal was a Brer Rabbit, and a honey-bee was a mathematical genius. But if he was parsimonious and a follower of William of Occam, what William James called tough-minded, he set his face sternly against anthropomorphism and reduced the animal to the level of an automatic machine." In trying to avoid the Scylla of reading the man into the beast, some observers fell into the Charybdis of leaving the animal mind out altogether. Others in recoiling from the automaton theory fell into the trap of credulous over-generosity. It is interesting to find such a tough-minded and sceptical philosopher as David Hume writing that "no truth is more evident than that beasts are endowed with thought and reason," a generous position which no one would defend nowadays except in regard to the highest animals.[2] On the other hand, when we hear

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[1] "The New Natural History, being The Twenty-fifth Robert Boyle Lecture," Oxford University Press, 1923.

[2] *Editor's Note.*—This is perhaps stated too strongly. Thus Professor Wheeler writes: "Whether a stinging ant or hornet merely exhibits a pure reflex act, or has a feeling of anger besides, is a nice problem. I have unintentionally sat on nests of *Vespa germanica* and *Pogonomyrmex barbatus*, and, while I have no doubt that I myself acted reflexly under the circumstances, it will take quite an army of physiologists to convince me that these creatures were acting as nothing but reflex machines" ("Ants," 1910, p. 529). Donisthorpe also states that "personally from observations on ants both in nature and captivity I am prepared to grant them something approaching 'reasoning power'" ("British Ants," 1915, p. 46). Other quotations could be given, but space does not permit.

Spinoza saying, "No one has yet learned by experience what the body, as body, can or cannot do," we detect the modern caution. We see an anticipation of what is sometimes called "the principle of Lloyd Morgan," that no act should be ascribed to a higher mental faculty if it can be satisfactorily accounted for in terms of a lower one. And that may be extended to the proposition, that if we can adequately describe an animal's activity in terms of the body we need not drag in the mind as an operative factor on that occasion. But most students of animal behaviour will agree that there are many occasions when no adequate description can be given without recognising that mind counts.

We see, then, that when Sir John Lubbock began to interest himself keenly in the ways of animals, there were two main obstacles to be overcome. Without forgetting the work of giants like Réaumur and resolute observers who followed his scrupulous methods, we must recognise the frequent prevalence of amateurishness and anecdotalism. The cure that Sir John Lubbock discerned and sought after was *Experiment.* In the second place, those who advanced from describing occurrences to formulating laws of behaviour were torn between two opinions, according as they emphasised the bodily or the mental aspect, the physiological or the psychological, the nervous system or the psychical life. Here again Sir John Lubbock discerned and sought after a way out, the narrow way of *Experiment*, which has led to such wonderful results in modern times—for instance, the discovery of the fact that the so-called sense of direction in the Loggerhead Turtle when he makes straight for the sea is simply an engrained obligation to answer back to the part of the horizon which is openest and perhaps also to the part with the most blue sky. It is our conviction that the greatest of the many services that Lord Avebury rendered to zoology was in being *a pioneer of the experimental study of animal behaviour.* What he did we now wish to illustrate.

Colour Sense in Bees.

It is a fact of observation that bees and other insects pay many visits to brightly coloured flowers; and, since Darwin's day, the conclusion has often been drawn that the bright colours serve as advertisements to the visitors. Moreover, the insects are often credited with a share in the evolution of the brightness of flowers, for those plants would have most seed that received most visits from a large number of insects carrying the fertilising pollen. These are important conclusions (see Professor A. C. Seward's chapter on Lord Avebury's contributions to Botany), but it is plain that they need a good deal of proving, and it is interesting to ask how far that has gone. Lord Avebury tells us ("Ants, Bees and Wasps," p. 291) that on July 12th one year he brought a bee to some honey which he placed on blue paper, putting a similar quantity on orange paper about three feet off. "After she had returned twice I transposed the papers; but she returned to the honey on the blue paper. After she had made three more visits, always to the blue paper, I transposed them again, and she again followed the colour, though the honey was left in the same place." Numerous slightly different experiments were made on subsequent occasions, and Lord Avebury was led to the conclusion that bees distinguish different colours. Moreover, by taking careful note of the visits that bees paid to honey-baited slips of glass resting on coloured paper and disposed on a lawn, he reached the conclusion that blue was the favourite colour. One of the methods was to take the percentage in which the bees went to each colour first, second, third, and so on. The colours were blue, green, orange, red, white, and yellow; and there was also a slip of plain glass without any paper. "Out of a hundred rounds the bees took blue as one of the first three in 74 cases and one of the last four only in 26 cases; while, on the contrary, they selected the plain as one of the first three only in 25 cases, and one of the last four in 75 cases." In such ways the conclusion was reached that bees prefer one colour to another, and that blue is distinctly their favourite. Lord Avebury went on from this to the conclusion, which does not concern us so much here, that bees have played an important part in the evolution of blue flowers from inconspicuous greenish ones.

It cannot be said that entomologists are unanimous in regard to the colour-sense of bees, but what is perhaps more important is that since Lord Avebury's pioneer work no one has presumed to discuss the problem without having recourse to experiment. Part of the difficulty in giving a yes or no answer is in devising experiments where the colours associated with the baits are all alike in intensity. It may be that a bright flower attracts bees because it is bright and not because it is of a particular colour—blue, red, or yellow. The distinguished Swiss entomologist, Auguste Forel, believes that he has overcome the difficulty, and he corroborates Lord Avebury in concluding that bees discriminate blue and red, for instance, as such—that they discriminate between *qualities* of light as distinguished from *intensities*.

Bees and the Odours of Flowers.

It seems to have been satisfactorily proved that the sense of smell plays an important part in the life of bees. Very numerous nerve-endings, believed to be olfactory, have been described on various parts of the body. It is probably by the absence of a specific odour that worker-bees know in a minute or two when the queen has been removed from the hive, and it is probably by the presence of an unusual scent that they quickly detect the entrance of an intruder. Numerous experiments with flower-visiting insects have proved the reality of an acute sense of smell, and here again in 1875 Lord Avebury made an important contribution. He proved that insects are keenly sensitive to the perfume of the essential oils which are found in the petals of many flowers. Whatever may be the value of coloration as an advertisement to flower-visiting insects, such as bees, there is no doubt that floral odours are of great importance. And besides the perfume of the essential oils there is the subtle fragrance of the nectar itself. It is safe to accept the conclusion of Perez that "for distances at which sight cannot be any help, the bees, and without doubt most insects, are guided in their search for flowers by odours transported by the currents of air." Kerner saw the Convolvulus Sphinx Moth fly straight to the invisible flowers of honeysuckle situated a hundred yards away. It is not merely that bees are very sensitive to fragrance of particular kinds, we must think of them as forming associations between a particular odour and a particular kind of flower that rewards them well. It is this welding of linkages (in the mind and in the body) that makes bees what Darwin called "good botanists," recognising the same kind of flower even when its appearance is different.

Homing of Ants and Bees.

In another chapter Mr. Donisthorpe has shown what big things Lord Avebury did in connection with ants. We are approaching the subject from a different angle, for we are considering in these paragraphs the study of animal behaviour, and we wish to illustrate Lord Avebury's enquiry into "homing." It is well known that many animals such as cats and dogs, horses and cattle, have a remarkable capacity for finding their way home from a considerable distance. Cats sometimes do this when they are transported to another town in a closed basket. Unluckily our information on homing mammals remains very anecdotal. As Lord Avebury would have pointed out, there is need for *Experiment*.

We have relatively scant knowledge of homing among the higher animals, but a great deal of time and care has been given to the study of similar phenomena among ants. As we have said, we must recognise Lord Avebury as one of the pioneers.

When Lord Avebury removed an ant from its beaten track and to some distance from the nest, the little creature was often badly nonplussed. Drawings were made of its route, and the circuitousness was sometimes extraordinary. In other cases, however, the way home was found with considerable success. It soon became plain that different species differed markedly in their homing capacity. By pretty experiments it was shown that some ants were influenced by differences in the direction of the light, while others nosed their way along by taking advantage of minute olfactory traces left by their previous footsteps. Many of the experiments were very ingenious, and have been repeated by other investigators; but it is difficult to make them intelligible without diagrams. Let us take a simple case. When black ants (*Lasius niger*) were carrying off larvæ placed in a cup on a piece of board, and Lord Avebury turned the board round so that the side which had been turned towards the nest was away from it, and *vice versa*, the ants always returned over the same track on the board. This had the unfortunate consequence that they marched directly away from home. "If I moved the board to the other side of my artificial nest, the result was the same. Evidently they followed the road, not the direction." In other words, they were following the scent like Lilliputian dogs. In some other species the turning round of a section of an artificial wooden bridge, on which they were walking, did not throw the ants out of their reckoning. They differ in their endowments.

The kind of experimental investigation which Lord Avebury was one of the first to utilise has been much in vogue ever since; and it seems safe to conclude that ants *learn* how to find their way home. They make many mistakes at first, but they gradually improve. They utilise little hints which come to them through the senses of smell, touch, and sight; and in certain cases there is evidence of a "muscular memory" of the journey taken. If there is a gradual learning of the way home, the homing of ants must be very different from the homing of birds.

Lord Avebury made some simple experiments in regard to way-finding in bees, but they did not lead to very conclusive results. He would give a bee a treat of honey at the window of his sitting room, but the bee did not come back for more, nor did it send any of its friends. He was patient enough to try this more than twenty times, but the result was always disappointing. He did not find much evidence of way-finding ability or sense of direction in his bees, but with his characteristic fair-mindedness he gives at the end of "Senses of Animals" an account of some observations made by Mr. Romanes which point to the conclusion that bees acquire a knowledge of landmarks in the vicinity of the hive. This is the view held by most naturalists to-day, and it has been established by following the experimental trail which Lord Avebury blazed. Most of the experiments indicate that bees build up a sensory knowledge of the country round about their home. They serve an apprenticeship, feeling their way from finger-post to finger-post. They usually have a trial flight or "orientation flight" when they first leave the hive, just as if they were taking their bearings. Dr. Buttel-Reepen has shown that bees removed from the hive before they have had their orientation-flight do not return, and that if the hive be taken some miles away the inmates have to serve a new apprenticeship in finding their way about. Professor Yung of Geneva took twenty marked bees from a hive near the lake, put them in a box, and took them two and a quarter miles into the country. Seventeen of them returned, some in an hour. Next day the seventeen were put back in the box and taken on a boat to a distance of a little over a mile on the lake. When they were set free, they flew off in all directions, but none returned. There were of course no landmarks on the water.

Lord Avebury was not dogmatic on the subject—he was always an open-minded enquirer—but it is evident that he was not attracted by the hypothesis of a mysterious "sense of direction." How keenly he would have appreciated the abundant experimental work of recent years, which tends to support the view that bees *learn* the geography of their region.

Yet we must try to be open-minded as Lord Avebury was, and we cannot shut our eyes to the views of the minority who believe, like Fabre, that bees have an *intuition des lieux.* There are some facts behind this view. Thus Prof. Gaston Bonnier observed that bees carried afield from the hive, to a distance of over a mile, and separated from the hive by a wood, rose in the air and made straight for home. They made a "bee-line" in fact, and found their way to the hive. What would Lord Avebury have said if this observation had been made in his lifetime? He would have said: We must make more experiments.

Experiments with Wasps.

Lord Avebury worked with wasps, as well as with bees, and some of his results were very interesting. He showed that wasps can distinguish "colours," but with preferences less marked than in the case of bees. On the other hand, they showed more ability in finding their way back to treasure-trove and, so far as the experiments went, a surer recognition of the way home. In "Ants, Bees and Wasps" (p. 322) we read: "Every one has heard of a 'bee-line.' It would be no less correct to talk of a wasp-line. On August 6th I marked a wasp, the nest of which was round the corner of the house, so that her direct way home was not out of the window by which she entered, but in the opposite direction, across the room to a window which was closed. I watched her for some hours, during which time she constantly went to the closed window, and lost much time in buzzing about at it." On August 8th and 9th, 12th and 13th, 15th and 16th, "she continued to visit the honey, but still, always, even after ten days' experience, continued to go to the closed window, which was in the direct line home; though on finding it closed she returned and went through the open window by which she entered." We have quoted the dates because they illustrate Lord Avebury's capacity for taking pains. His observations were interrupted by absences from home, but he did not allow these to interfere with his persistent attention to the wasp-problem. His results seem to us to suggest the reality of a sense of direction not based on topographical landmarks.

Lord Avebury proved that wasps are quick to learn their way to and from hidden treasure, but he refuted the theory that they habitually communicate the good news to one another. If several wasps come to know of the concealed honey, it is because they follow the original discoverer. Let us cite one of the experiments on learning the way. "On September 20th I marked a wasp and put her to some honey, which she visited assiduously. The following morning I opened my window at 6, and she made her first visit at 6.27, the temperature being 61° Fahr. I then placed the honey in a box communicating with the outside by an india-rubber tube six inches long and $\frac{1}{3}$-inch in diameter. The wasp, however, soon got accustomed to it, and went in and out without much loss of time" ("Ants, Bees and Wasps," p. 426). On the 24th Lord Avebury had a holiday, so he watched his wasp all day! She began work at 6.40 and continued till 5.52, though the weather was not very good. The total number of visits was 61; but this is not anything like a wasp's maximum. On another occasion 116 visits were counted. "I have been much struck," he writes, "by the industry of wasps. They commence work early in the morning, and do not leave off till dusk. I have several times watched a wasp the whole day, and from morning to evening, if not disturbed, they worked without any interval for rest or refreshment" ("Ants, Bees and Wasps," p. 321). We get a glimpse of the spirit of the true naturalist. He spent the whole holiday watching a wasp![1]

The Inclined Plane of Behaviour.

Thanks to pioneer workers like Lord Avebury, it has become clear that we must not take the activities of animals at their face value. Physiologically and psychologically they are at diverse levels, and eventually they must be arranged on a long inclined plane. Let us illustrate.

There are some ants, less military than others, that roll themselves into a ball when they are touched. This is a reflex action, requiring neither thought nor will, depending on pre-established linkages between certain nerve-cells and certain muscle-cells.[1]

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[1] *Editor's Note.*—See the passage about his tame wasp in the selections at the end of this volume (p. 229). Lord Avebury had also the gift of interesting others in his experiments, and so enlisted many assistants and volunteers to watch his insects whilst he had his meals or attended to his duties in the City.

Bees and many other insects fly towards the light, whereas cockroaches scurry away from it. This is called phototropism, and Lord Avebury was among the first to show that it plays an important part in the life of many of the lower animals. Ants avoid direct sunlight and likewise violet rays, but, as Lord Avebury showed, they will subject themselves to violet rays rather than to ultra-violet rays, if there is no alternative. There does not seem to be any choosing or preferring; the responses are inevitable or obligatory; and each kind of animal has its particular optimum of illumination, temperature, moisture, and so on, though this may vary according to the creature's condition. Thus some caterpillars climb towards the light when hungry and away from the light when they have fed. All these obligatory movements are called "tropisms," and a good illustration is afforded by the way the moth circles round the candle. This is not because of "curiosity" or because of "attraction"; it means that the muscles on the more illumined side are more intensely active, and the body of the moth is automatically compelled to orient itself in such a way that both sides of the head are equally illumined. But if it continues flying, it is more than likely to find itself in the flame. If it were a slow-going creature, the heat would put on the brake before the fatal event. The important general point is this, that when an animal makes straight for light, warmth, moisture, or something of the sort, it is in many cases doing so not through any resoluteness, but because it is being equally stimulated on both sides. We think, however, that it is an unwarranted exaggeration to say that most of an animal's—even an insect's—behaviour is accounted for in terms of reflex actions and obligatory movements.

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[1] *Editor's Note.*—In his great work on "British Ants," 1915, on p. 46, Mr. Donisthorpe writes: "Under certain circumstances ants will break away from their ordinary behaviour and adapt themselves to new conditions; this plasticity is what Hobhouse defines as 'the power of an organism to adapt action to requirement without the guidance of an hereditary method of adjustment.' . . . For example they soon realise that they are going to be fed when a nest is uncovered and do not endeavour to escape at once; such species as *Myrmecina graminicola*, which, when touched, usually roll up and feign death, are with difficulty induced to do so after having been kept for some time." I was much struck by this last experiment which Dr. Donisthorpe demonstrated for me when he showed me his colony of this ant, which he has kept in captivity for 13 years and 7 months.

Dr. Auguste Forel also ("Le Monde Social des Fourmis," 1922, Vol. III, p. 19) describes a wonderful adaptation of Algerian Ants, which he says proves that they are able to learn from experience, and therefore that they exhibit something very like mind in their behaviour.

On a different line is that kind of behaviour which consists in establishing simple associations. Lord Avebury showed that bees are constitutionally very sensitive to certain perfumes, such as those found in the essential oils of certain petals. This sensitiveness will form the basis of the visits the bees pay to the flowers, and the directness of the insect's flight is probably a tropistic phenomenon. That is to say, the bee is automatically orienting its body—so that it receives on each side of its sensitive surfaces an equal bombardment of odoriferous particles. But there is more than that, for the experiments made by Lord Avebury and others go to show that the bee establishes associations between a particular fragrance and a good draught of nectar. Lord Avebury devoted much time to proving that ants recognise those of the same nest, even when they are intoxicated, and that they recognise young ones as kindred though they have never seen them before. He gave his reasons for concluding that the recognition is not effected by means of any sign or password. The strong probability, if not certainty, is that an association is established between a specific odour and friendly behaviour. Given the strong kin-sympathy which seems to be inborn in ants, it works usefully in everyday life because an association or linkage has been established between a specific odour and friendly behaviour. Mind is at work as well as body.

Let us ascend the inclined plane a little further. When a wasp learns to go quickly through a dark tube leading to concealed honey, it is illustrating a kind of behaviour that is based on individual experience, and it may be an individual experiment. By sensory discrimination, by trial and error, by welding links or associations that are remembered, the insect learns to do a difficult thing, "profiting by experience" as is often said. The oftener the animal goes through the performance the easier it becomes, and this is called individual habit-forming. We have cited Lord Avebury's case of the wasp, but there are not many similar cases to be found in his records, the reason being that he dealt mainly with ants and bees in which instinctive routine is very perfect, leaving relatively little need or room for individual initiative or experiment, whether at the level of intelligence or somewhat simpler.

Instinctive Behaviour.

Between intelligent behaviour on the one hand and tropistic behaviour on the other there is a vast stretch of activities, not all on the same level, which are technically called *instinctive.* To these Lord Avebury devoted much attention, and we may illustrate them by the way in which the worker-ants of a disturbed nest hurry with one accord to save the cocoons; by the effective way in which a hive-bee, ushered for the first time into a daylight world, proceeds to tackle a difficult flower like a snapdragon, collecting nectar and pollen as if it had been at the business all its life; by the skill with which a wasp builds a hanging house of wood-pulp chewed into paper; or by the beautiful web of the garden spider which is made true to type the very first time. One of the agricultural ants of southern Europe collects the seeds of Leguminous plants, such as vetches. These are taken underground and allowed to sprout. The germination bursts the hard seed-envelopes and is associated with processes of fermentation. At a certain stage the ants take the germinating seeds out into the sunshine, and this kills them. The softened reserves in the seed are chewed into a dough; this is cut into minute discs, like biscuits; these are dried in the sun and then taken underground to be stored. Here we have a chain of many links, one leading on to the other, and this is very characteristic of the more complicated forms of instinctive behaviour, such as making a honeycomb. But the performance does not require to be learned; it may be improved by practice, but it may be exhibited in perfection on the very first trial. It is the expression of an inborn or hereditary capacity for doing apparently clever things. It is shared equally by all members of the species of the same sex. It has a routine character, and though it may be occasionally adjusted (by intelligence) to suit particular circumstances, that is rather the exception than the rule. As Lord Avebury very clearly showed, it is subject to great limitations, for the instinctive creature is apt to be hopelessly puzzled when something disturbs its routine. Looked at from the physiological side, a piece of instinctive behaviour is like a chain of reflex actions, each link setting the next one into activity. But there is good reason for believing that there is in varying degrees a psychical aspect. The instinctive behaviour of the ant, the bee, the wasp, is suffused with awareness and backed by endeavour. Comparative psychologists differ among themselves as to the degree in which the mind is of practical importance in instinctive behaviour; and well they may, seeing that there are various levels of instinctive performance. Lord Avebury inclined to be generous.

On our view, instinctive behaviour differs markedly from intelligent behaviour in not requiring to be learned, in the frequent perfection of the first performance, in its approximately equal expression among members of the same species and of the same sex, and in its very definite reference to particular circumstances. The difference between instinctive behaviour and intelligent behaviour—both of them body-and-mind activities—is very clearly seen when we consider what Lord Avebury called "the limitations of instinct." The full-grown procession caterpillars often creep along for a considerable distance in Indian file; they continue doing so until they reach a patch of soft soil, in which they proceed to bury themselves. For they pass into the pupa or chrysalis stage underground. In nine cases out of ten the instinct works well. But when Fabre twisted the Indian file round so that the head of the foremost touched the tail of the hindmost, they continued going round and round in futile circumambulation several hundred times. As Fabre said, "Ils ne savent rien de rien."[1] The least glimpse of genuine intelligence would have broken the spell, but it was not forthcoming. When the Sphex wasp drags to the mouth of its burrow a cricket which it has paralysed by stinging the nervous system, it always lays it down and proceeds to investigate the burrow, to see if the egg it laid there is safe. On one occasion Fabre shifted the paralysed victim while the Sphex wasp was investigating underground. The insect came up, missed its booty, sought for it, found it again (for it was not far off), and dragged it for the second time to the mouth of the burrow. But there the tyranny of instinct asserted itself and the Sphex had to deposit the cricket and re-investigate underground. Fabre played the same trick a second time, a third time—a fortieth time, and with the same result.

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[1] "They know nothing about anything."

Now Lord Avebury was very well aware, as we have said, of these limitations of instinct, but he did not draw the conclusion which seems clear to many naturalists of to-day that instinctive behaviour and intelligent behaviour are on quite different evolution-tacks. There is no reason to believe that instinctive behaviour is a sort of low-grade form of intelligent behaviour, and there is little reason to believe that instinct is due to "lapsed intelligence." The two kinds of behaviour are on different lines; each has its advantages and its disadvantages. Sir E. Ray Lankester has drawn a sharp distinction between the "little brain" type of animal, rich in ready-made instincts, but far from educable, and the "big brain" type of animal, with few specialised instinctive capacities, but with astonishing powers of rapid learning. The climax of the "little brain" type is seen in ants, bees, and wasps; the climax of the "big brain" type is seen in birds and mammals. We venture to think that the reason why Lord Avebury stopped short of drawing this distinction was that the experimental work he did so much to initiate was not yet sufficiently extensive. It had to be followed by the work of men like Professor Lloyd Morgan and Professor Jacques Loeb, to whom we owe much for clearing up instinctive behaviour and tropisms respectively. The recognition of an inclined plane or ascending curve of behaviour is still far from being luminously discerned, but definite progress has been made; and we look back with gratitude to Lord Avebury as one of the distinguished pioneers.

What has just been said should be borne in mind when we read, for instance, the first paragraph of the classic book "Ants, Bees and Wasps": "The Anthropoid Apes no doubt approach nearer to man in bodily structure than do any other animals; but when we consider the habits of

Ants, their social organisation, their large communities, and elaborate habitations; their roadways, their possession of domestic animals, and even in some cases of slaves, it must be admitted that they have a fair claim to rank next to man in the scale of intelligence." This very striking sentence marks a milestone in the study of animal behaviour, but we do not think that many naturalists of to-day would credit ants with much intelligence in the strict sense.

Intelligent Behaviour.

When we use the term intelligent behaviour carefully, contrasting it with instinctive behaviour, we mean that there is some judgment, some "putting two and two together," some profiting by experience. As Romanes puts it, there is behind intelligent behaviour a mental process of "perceptual inference." We cannot satisfactorily describe the behaviour without implying that the animal is thinking, even if it be in a simple "picture-logic" sort of way. If there were evidence of experimenting with general ideas or concepts, that would be *reason* in the strict sense, but, so far as we know, reason or "conceptual inference" is confined to man.

We saw intelligent behaviour one day when the Polar Bear in the Edinburgh Zoo stood at the edge of its peninsula of rock jutting out into the water, and scooping with its great paw made a current so that the buns which had fallen short and were floating on the surface came drifting within reach. That was adapting old instruments to a novel end; it was surely backed by a perceptual inference.

This brings us to Lord Avebury's experiments with a black poodle called Van. An account of them will be found at the end of the volume on "The Senses of Animals." The particular form of the experiment was suggested to Lord Avebury by reading the story of Laura Bridgman, who became blind and deaf when about two years old. She learned to distinguish labels with embossed raised letters which were attached to common objects, like s-p-o-o-n to spoons and k-e-y to keys. After a time "her intellect began to work, the truth flashed upon her, and she perceived that there was a way by which she could herself make a sign of anything that was in her own mind and show it to another mind." Lord Avebury resolved to apply a similar method to the dog Van.

"I took two pieces of cardboard about ten inches by three, and on one of them printed in large letters the word FOOD, leaving the other blank. I then placed the two cards over two saucers, and in the one under the food card put a little bread and milk, which Van, after having his attention called to the card, was allowed to eat. This was repeated over and over again until he had had enough. In about ten days he began to distinguish between the cards. I then put them on the floor and made him bring them to me, which he did readily enough. When he brought the plain card I simply threw it back, while when he brought the 'food' card I gave him a piece of bread, and in about a month he had pretty well learned to realise the difference."

To the first word "food" others were added—such as "out," "bone," "tea," "water," and along with these there were some to which it was not intended that the dog should attach any significance, such as "nought" and "plain." The important point is that Van gradually got to recognise several words, such as "out," "tea," "bone," and "water." "If he was asked whether he would like to go out for a walk, he would joyfully fish up the 'out,' card, choosing it from several others, and bring it to me, or run with it in evident triumph to the door." It may be noted that the cards were not always put in the same places or positions, and there were many copies of the same card so as to exclude the possibility of guidance by scent. The dog would look down a row of twelve cards on the floor and pick out "food" or "tea" with only occasional mistakes.

Let us take one other instance of Van's mastery of an association. "I used to leave a card marked 'water' in my dressing-room, the door of which we used to pass in going to and from my sitting-room. Van was my constant companion, and passed the door when I was at home several times in the day. Generally he took no heed of the card. Hundreds, or I may say thousands, of times he passed it unnoticed. Sometimes, however, he would run in, pick it up, and bring it to me, when of course I gave him some water, and on such occasions I invariably found that he wanted to drink" ("Senses of Animals," p. 269).

What did the dog actually learn? It learned to discriminate between certain cards, and it learned to associate a particular pattern of black marks with a particular pleasant experience. There was sensory discrimination and there was associative memory, but there was also an intelligent appreciation of the situation. It learned to use a very artificial method of securing the gratifications of food, tea, and an outing. In the case last cited of the dressing-room card marked "water," there was good evidence of some understanding. But it would be going much too far to credit the dog with realising that these words—mere black markings to him—were symbols of things.

Lord Avebury's experiments with his dog were early instances of a type that has often been repeated. To a large number of sounded words a dog will learn to respond in a perfectly definite way, sometimes involving rather complex behaviour. To the sounds "one" to "five" a chimpanzee will learn to respond by holding out the correct number of straws. But the shepherd's dog learning its business under the combined tuition of its master and one of its parents will show intelligent learning at a much higher level of complexity.

It may be noted that Lord Avebury gave some examples of what probably involves genuine intelligence among ants, bees, and wasps—namely, in those cases where the ordinary instinctive routine is modified in adjustment to peculiar circumstances. It is in these departures from routine that we are most likely to get glimpses of intelligence among those little-brained animals that are predominantly children of instinct. But the distinction between instinctive and intelligent behaviour had not been defined in Lord Avebury's day, and this is to be remembered when we read this fine sentence: "When we see an ant-hill, tenanted by thousands of industrious inhabitants, excavating chambers, forming tunnels, making roads, guarding their home, gathering food, feeding the young, tending their domestic animals—each one fulfilling its duties industriously, and without confusion—it is difficult altogether to deny them the gift of reason; and the preceding observations tend to confirm the opinion that their mental powers differ from those of men not so much in kind as in degree." To us this seems too generous, but it was the well-considered judgment of one who knew his material well.

"*The Senses of Animals.*"

When he was trying to understand the manners and customs of insects, Lord Avebury felt the need of studying the various sense-organs by which news comes in from the outer world and by which the triggers of action are pulled. He set to work experimenting for himself, but he also made himself acquainted with the numerous memoirs that had been written on the subject. He embodied his results in a very interesting book, the full title of which is "The Senses, Instincts, and Intelligence of Animals, with special reference to Insects." We wish to refer to some of its larger conclusions. Although Lord Avebury followed the usual plan of recognising five senses—touch, taste, smell, hearing and sight, he makes it quite clear that this is far too simple. "We have five senses, and sometimes fancy that no others are possible. But it is obvious that we cannot measure the infinite by our own narrow limitations. . . . We find in animals complex organs of sense, richly supplied with nerves, but the function of which we are as yet powerless to explain. There may be fifty other senses as different from ours as sound is from sight" ("Senses of Animals," p. 192).

The sensory cells of an animal's body are like scouts which send in news to the G.H.Q. cells of the central nervous system, but they also play a very important rôle in evoking appropriate answers-back in frequently recurrent circumstances which do not require the attention of General Head Quarters, but only of the Executive Officers, technically called motor nerve-cells. One of the changes since Lord Avebury's day, in regard to the sense-organs, is that we think more of them as the receptors of signals from the outside world, and less of them as producing sensations and supplying materials from which the mental life is built up. They are, indeed, gateways of knowledge as well as trigger-pullers, but the second is their primary rôle, especially among the lower animals.

We can think of different kinds of scouts who are good at detecting different kinds of occurrences—one quick of hearing, another alert to changes in scenery, a third sensitive to chemicals in the air, and so on. In the course of evolution the tendency has been towards an increased specialisation of sensory nerve-cells. There have come to be numerous kinds of specialised scouts, each very alert to one particular kind of change in the environment, and we must include along with that the animal's own body. We believe that Lord Avebury's "Senses of Animals" contributed not a little to the recognition of the multiplicity of sensory organs.

There are diverse groups of sense-organs or sensory cells. There are those that respond to chemical substances brought into contact with them in solution—the sense of smell, the senses of taste, and the general chemical sense. There are those that respond to changes of pressure exerted by impinging bodies and vibrations—the sense of hearing and the senses of touch. As with taste, so with touch, we must think of the sense in the plural. The sensory endings in our skin by which we become aware of the deforming pressure exerted by the grasp of our friend's hand are different from those by which we feel that his hand is very hot or very cold, or from those which make us wince with pain at the strength of his grip. In other words, the strict tactile sense is quite different from that of the sensory endings that are stimulated by heat and cold; and the sense of pain is different from the other three.

Then in regard to hearing, Lord Avebury was greatly interested in those ear-like sense-organs which occur in many of the lower animals which nevertheless give us no hint that they can hear. "Ears have they, but they hear not." In some cases it is probable that the ear-like organs may respond to sounds which are beyond the limits of our hearing; in other cases it is possible that in the experiments made to test the presence or absence of the sense of hearing, no sound was produced in which the creature was in any way interested; but it is proved for many animals that the ear-like organs are not hearing ears at all, but balancing organs which make the animal aware of its movements or bring about automatically an adjustment securing equilibrium. This equilibrating function was probably the primary use of the ear, and it persists in certain parts of the ear in backboned animals and in man, *e.g.* in the three semicircular canals.

Many members of the cricket and grasshopper order (Orthoptera) have a vibrating drum or tympanum on the foremost leg, or on the first segment of the abdomen; and this drum is connected with a complicated internal organ, including a bladder with fluid and numerous nerve-endings. It is probably safe to regard this as a genuine ear, not merely because its structure is admirably adapted to receiving and transmitting sound-waves, but because we know that a female grasshopper answers-back by movements when the male uses his musical instrument, and that the male answers-back to the counterfeit chirping produced by a file and a quill. Lord Avebury had the great satisfaction of discovering (in 1877) a somewhat similar organ in the tibia of several different kinds of ants—a fine example of his skill in studying minute structure.

In connection with hearing in insects we may recall the well-known experiments of Mayer. He carefully watched a male mosquito when tuning-forks were sounded in the vicinity, and noticed that certain tones caused certain of the bristles on the feelers to vibrate sympathetically. The most vigorous vibration was exhibited by the mosquito in answer to a tuning-fork producing 512 vibrations per second, which corresponds approximately to the note on which the female hums. If the male adjusts his head (by automatic tropism?) so that both antennæ are equally stimulated, he is likely to find the female if he goes straight ahead. This is, we think, a good illustration of what Lord Avebury was particularly keen about in his study of the senses; he wished to utilise the knowledge gained by minute analysis so as to make the episodes of the animal's everyday life more intelligible.

One of the outstanding results of the investigations of

Lord Avebury and others has been the disclosure of the variety of visual organs. Even in one and the same animal, such as a hive-bee, there may be two different kinds of "eyes," as different as different could be. The three minute ocelli or "simple eyes" on the top of the bee's head are very different from the large compound eyes on the sides of the head, which are composed of thousands of eye-elements, each like a complete eye in miniature. The "simple eyes," which have one lens each, like the Vertebrate eye, are very near-sighted and have at most a very limited power of image-forming. They are probably of most use in distinguishing between light and darkness. The compound eyes, on the other hand, are very perfect structures, though built on a plan entirely different from the human eye. In the worker bee there are in each eye, according to Mr. Cheshire, about 6,300 "eye-elements," each with its lens and a facet on the surface; in the queen, who is more of a stay-at-home creature, there are 4,920 facets; in the drone there are 13,090, this large number being perhaps of use on one occasion in his life—when he catches a glimpse of the queen on her nuptial flight.

Lord Avebury was very keenly interested in the compound eye and the kind of vision which it afforded. His investigations led him to support what is called the "mosaic theory" proposed by the great comparative physiologist, Johannes Müller. It is called the "mosaic" theory because the main idea is that the image formed in the back of the eye is formed by thousands of separate points or spots of light, each corresponding to a distinct portion of the field of vision. "According to Müller's view only those rays of light which pass directly through the crystalline cones, or are reflected from their sides, can reach the corresponding nerve fibres. The others fall on and are absorbed by the pigment which separates the different facets. Hence each cone receives light only from a very small portion of the field of vision, and the rays so received are collected into one spot of light. The larger and more convex, therefore, is the eye, the wider will be its field of vision; while the smaller and more numerous are the facets, the more distinct will the vision be. In fact, the picture perceived by the insect will be a mosaic, in which the number of points will correspond with the number of facets" ("Senses of Animals," p. 163).

Senses of Ants.

Without unduly overlapping Mr. Donisthorpe's chapter on Ants, we may unify what we have to say in connection with Lord Avebury's work on the senses of animals by referring to ants in particular.

Ants are inordinately fond of honey, and will stop to sip it even when their life is in danger; yet when a little strychnine is mixed with the honey, the ants stop after a taste or two. By this simple experiment and by many others we are assured that ants have a sense of taste; and the taste-endings are situated on the "tongue" and adjacent mouth-parts.

There is abundant evidence that ants can smell honey from a considerable distance, and can discover where the feast is. The sense is situated at the tip of the antennæ. According to Forel, ants are helped in their way-finding by a recollection of odours, and he maintains that a near-hand sense of smell makes ants aware of the shapes (!) of surrounding objects.

On the feelers and on the lower parts of the legs, and on some other parts of the body of an ant, there are touch-bristles of great delicacy, and some minute papillæ on various strategic places may also be tactile. As Lord Avebury showed, ants are exquisitely sensitive to differences of pressure and texture, and also to vibrations. Perhaps the stiffness of their armour makes ants feel very minute impacts as if they were concussions. They seem able to discriminate between a gust of wind and the quick movement of a man's arm. There is some evidence of a sense of pain, but if this sense is present it must be rather different from ours, for ants will go on eating honey for a short time after they have lost the posterior half of their body—reminding one of Munchausen's horse.

Lord Avebury discovered, as we have already noted, a somewhat ear-like organ on the tibia of the fore-leg of some ants; and Professor W. M. Wheeler, the greatest American authority on ants, regards this structure as a receptor for the minute pinpricks of sound which many ants make when they discover some alimentary treasure. Some of these fiddling or "stridulating" sounds are audible to the human ear; what bugle-calls they may be to the ants! But we must not be in a hurry: to many sounds ants remain quite indifferent. There is evidence that ants are able to register their movements, to remember the direction in which they journeyed, and whether it was up or down. There is evidence of balancing or equilibrating, but where the organs concerned are situated remains uncertain.

There is no doubt that ants are very sensitive to changes of temperature. Cold paralyses them, and dry heat is equally fatal; but the point is that they seek to avoid these extremes, and not for themselves alone, but also for the brood, which they laboriously shift away from too great cold and away from too great heat. Their thermometer sense works at a distance, but what particular bristles catch the broadcasting we do not know.

Although ants are predominantly smell-minded, whereas we are predominantly eye-minded and ear-minded, those that have well-developed eyes are quick to detect *movements*, though not good at perceiving *forms*. They have not much colour-sense; and, as Lord Avebury proved, they are very sensitive to ultra-violet rays. This brief review must serve as an indication of the kind of knowledge that Lord Avebury began to gather.

Life-Histories of Insects.

People often speak of the *wonders* of life. The study of a wonder makes other things more significant, makes the whole world deeper and higher. Of course science is always explaining away what may be called the *minor* wonders, like the rainbow, but it never fails to leave *major* wonders, like light itself. Lord Avebury believed strongly in the wholesomeness of a sense of wonder, and what we mean by wonders of life finds clear illustration in the development of insects, which was one of Lord Avebury's favourite subjects of study. He wrote a notable book—one of the Nature Series—called "The Origin and Metamorphoses of Insects" (1902).

What gives a peculiar interest to the life-history of insects is the indirectness of the development in all the higher orders—the ants, bees, and wasps (Hymenoptera); the moths and butterflies (Lepidoptera); the two-winged flies (Diptera); and the beetles (Coleoptera). Out of the egg of a grasshopper or an earwig there comes what is practically a miniature adult, but out of the egg of one of the higher insects there comes a larva, which is utterly unlike the adult form. It may be a caterpillar, a grub, a maggot, or something else—such as the quaint aquatic larva of a gnat, but in any case it has to undergo a great change (or metamorphosis) before it begins to put on the adult characters.

In the familiar case of the butterfly what emerges from the egg is a small caterpillar, with biting mouth-parts, simple eyes, very minute antennæ—in short, with very little resemblance to its parents. It feeds and grows and moults its husk (or cuticle), and this logical process is repeated over and over again. The caterpillar becomes larger and larger, it gains in strength, it eats much more than it needs, it accumulates abundant reserves. Slowly, however, a transformation begins, as indicated for instance by the appearance of the foundations of the wings. The larval body is in great part broken down and a new body is built up on a very different architectural plan. Meanwhile, as everyone knows, the caterpillar has sunk into a quiescent stage, the pupa or chrysalis, which often lasts for a long time. When the great change is accomplished, if the time is ripe, the butterfly emerges, as if by a second birth. Thus we have four chapters—the egg and the developing embryo, the larva, the pupa, and the imago or winged insect.

The remarkable features in this familiar story are briefly these: (1) that the larva is very different from the parent; (2) that after a vigorous life devoted to food-getting there is a crisis, old organs begin to be taken to pieces, and new organs begin to arise; and (3) that soon after the onset of the transformation there is a collapse into a quiescent fasting stage, which may continue for months, *e. g.* through the winter. It looks as if a new set of hereditary factors began to assert themselves at a certain stage in the life-history, for as the caterpillar's characters wane away the novel characters of the butterfly take their place.

In his book on "Insect Metamorphoses" Lord Avebury gave many striking examples of this transformation. In the case of flies the "scrapping" of the larval organs is very thoroughgoing—there is a sinking-back towards embryonic simplicity—so that if we open the pupa of a blue-bottle we find little trace of muscles, food-canal, or air-tubes, though these were plain enough in the maggot. In the case of butterflies and moths the breaking-down (histolysis) and the building-up (histogenesis) proceed in a sort of piecemeal fashion. The analogues of the two methods are familiar in a town where big buildings are undergoing transformation. Sometimes the whole structure is demolished and reconstruction follows after an interval during which business has been suspended. But in other cases the transformation is accomplished gradually, from corner to corner, with business as usual all the time. So we might contrast the metamorphoses of blue-bottle and butterfly.

If we turn from Lord Avebury's "Insect Metamorphoses" of 1902 to Professor G. H. Carpenter's "Insect Transformation" of 1921, we see that much progress has been made. But Lord Avebury's book shows plainly that he set himself resolutely to throw light on very difficult problems: what is the meaning of this circuitousness of life-history; what is the meaning of these larvæ so different in structure and function from what they sprang from, or from what they will give rise to; what is the meaning of this costly scrapping and recommencing—a metamorphosis that is often mortal. But more than that, Lord Avebury had hold of the right clue—which is in one word *Adaptation*. The primitive type of life-history is what we find in the most old-fashioned insects, such as the spring-tails, where the development is direct, without any metamorphosis. The circuitousness has been evolved in relation to seasonal and other difficulties, and in relation to securing reproductive success in the adult period. We see in the larva the intercalation of a feeding, growing, capitalising stage which makes the intensely active, often fasting, reproductive life of the winged adult more possible. The caterpillar's life consists mainly of obedience to the "urge" of hunger, but it makes possible the contrasted butterfly which is almost wholly preoccupied with the "urge" of love. In the "Insect Metamorphoses" there are fine examples of the circuitousness of the life-history in many insects, and the general interpretation is undoubtedly sound, that this is adaptive to the difficulties of times and seasons, food-supply and surroundings.

Bristle-tails and Spring-tails.

One of Lord Avebury's big pieces of zoological work was making a monograph of these two orders of insects, which are technically known as Thysanura and Collembola. Their study had been much neglected in Britain before he took it up; and we cannot wonder, for the insects in question are very minute and very difficult to handle.

Most of them live a hidden life, being what is called "cryptozoic," and the few that are not averse to showing themselves are quick to disappear. For these reasons few people have much acquaintance with Bristle-tails and Spring-tails, though they are very common. In the introduction to his Ray Society "Monograph of the Collembola and Thysanura" (1873), Sir John Lubbock, to give him his title at that date, wrote as follows: "The Collembola and Thysanura, which form the subject of the present work, have hitherto been but little studied in this country. Yet if a fallen bough be examined, a heap of moss shaken over a pocket-handkerchief, or any long herbage swept with a hand-net, the naturalist will not fail to find, together with numerous beetles, flies, and other insects, certain delicate hexapod, active little creatures; the majority of which will endeavour to escape, not only running with great agility, but also springing with considerable force, by means of a sub-abdominal, forked organ, which, commencing near the posterior end of the body, reaches forward, in most cases, almost as far as the thorax." Those that only run are the Bristle-tails (Thysanura); those that are able to throw themselves into the air are the Spring-tails (Collembola); and it was one of Lord Avebury's zoological contributions to show the separateness of the two orders. It was he who proposed the name Collembola. It may be noted that the Monograph of these little creatures is a stout volume of 276 pages with 78 fine plates, the anatomical drawings by Lord Avebury himself.

The little Bristle-tail called *Campodea staphylinus*, abundant in gardens about London, is one of the commonest of insects over a large part of Europe, and occurs from sea-level to the mountain tops—a fragile, white creature, quick to disappear in the loose earth. Another common representative called Machilis runs swiftly, with a suggestion of gliding, on the perpendicular faces of rocks or the big stones of "dry dykes." The "silver-fish," *Lepisma saccharina*, is common in houses, running about swiftly in search of particles of sugar or meal. It is about half an inch long. Sir Francis Darwin tells us in one of his delightful essays that "a diverting circumstance" in his youthful attendance at church was "the occurrence of book-fish (Lepisma?) in the prayer books or among the baize cushions. I have not seen one for fifty years, and I may be wrong in believing that they were like minute sardines running about on invisible wheels." The comparison is very apposite. These are three of the Bristle-tails that Lord Avebury studied so patiently.

On the surface of a pool of water in a shady place we sometimes see what look like floating iron-filings. This is a crowd of one of the Spring-tails (*Podura aquatica*), and an allied form is sometimes seen migrating in millions over a snow-field, like a moving black veil. Another kind, *Anurida maritima*, is peculiar in liking salt water. It congregates on the surface of shore-pools and can endure prolonged immersion. Lord Avebury speaks with appreciation of *Smynthurus luteus*, a common species in our meadows. "The males are very attentive to the females, and caress them lovingly with their antennae." Even these minute creatures have "habits," about which we have still a great deal to learn.

Most of the Spring-tails have a remarkable spring, which Lord Avebury investigated with great care, though it cannot be said that he entirely succeeded in discovering how it works. So far as we know, the puzzle is still only half solved. The spring has a basal piece and two parallel branches; these are carried bent forwards on the under surface of the insect and are retained in that position by a catch. "This projects from the under surface of the third segment of the body, descending between the two branches of the spring, and passing under the extremity of its basal segment" (Sharp, in "Cambridge Natural History," Vol. V, 1895, p. 191). The usually accepted view is that, when the catch is removed, the elasticity of the spring asserts itself and the insect is jerked into the air. There are some difficulties, however, in this interpretation, for the "catch" does not look very like an effective catch, and Lord Avebury found that it is not always present. He proved by admirable minute dissection in the case of Smynthurus that the muscles which draw the spring forward are more powerful than those that straighten it. "The power of jumping arises from the elasticity of the spring, and not from direct muscular action. This is, doubtless, a more economical arrangement of force. The catch answers to the catch in a crossbow, and as soon as it is drawn forwards the muscle pulls the spring downwards, and its own elasticity does the rest."

We must not linger too long over these minute creatures, but Lord Avebury made numerous novel observations on their habits and structure, and we wish to refer to two other points. In many Spring-tails the first segment of the abdomen bears on its ventral surface a well-developed organ called the "ventral tube." From a short downward-projecting tube there can be protruded two delicate glandular vesicles which are longer than the legs and are not unlike tentacles. They are apparently extruded by blood pressure and withdrawn again by muscular action. Lord Avebury was able to show that they are of use in enabling Spring-tails to adhere to vertical surfaces. "If a Smynthurus is laid on its back—a position from which it has some difficulty in recovering its feet—and if, while it is in this attitude, a piece of glass is brought within its reach, the animal will endeavour to seize it with the feet, but at the same time it will project one or both of the ventral tentacles and apply it, or them, firmly to the glass, emitting at the same time a drop of fluid, which, no doubt, gives a better hold" ("Monograph," p. 69).

Lord Avebury was much interested in the remarkable scales which are found on the body of Bristle-tails and Spring-tails. They are of intricate structure, covered with very fine lines and other sculpturings which give them great, though microscopic, beauty. The markings are so fine that the scales are often used as test-objects for lenses. The fineness of the lines accounts for the metallic shimmer that is characteristic of many of the little creatures. There is something to ponder over in this detailed microscopic beauty, and in the fact that each type of Bristle-tail and Spring-tail has its own specific pattern of scale.

What gives the Bristle-tails and Spring-tails their supreme interest is that they are old-fashioned primitive insects. They show their primitiveness in the absence of any trace of wings—even in the early stages of development, in the presence of appendages on the abdomen, in certain old-fashioned features of their mouth-parts, in the practical absence of metamorphosis (there is just a little in Thysanura), and in their somewhat larval appearance. They are old-fashioned insects that have not evolved far, except along by-roads of their own, such as the spring and catch. Dr. David Sharp speaks of the weakness and fragility and imperfection of a creature like Campodea, which is nevertheless very successful in holding its own in many parts of the world. Part of the secret of the persistence of the Bristle-tails and Spring-tails is no doubt that their minuteness has enabled them to find niches of opportunity all their own.

In Conclusion.

There are different ways of contributing to the advance of a science. Different workers make diverse contributions, or the same worker may make very different contributions at various times. Darwin's chief contributions were different from those of Huxley, and the service Darwin did in his Monograph on Barnacles was very different from that represented by "The Origin of Species." What were the chief services rendered to Zoology by Lord Avebury?

(1) We would place in the foreground the fact that he proclaimed by example and precept the need for experimental methods in the study of animal behaviour. At a critical period in the early development of that department of Zoology, he insisted on experiments, and his wisdom has been justified of its children.

(2) He made important contributions to our knowledge of the behaviour of ants, bees, wasps, and various other animals. These enquiries into behaviour were made in part under experimental conditions—often very ingeniously contrived, but others sustained the tradition of the old and indispensable Natural History—the study of the habits and surroundings of living creatures and their inter-relations with one another. In Professor Seward's chapter on Botany due account is taken of Lord Avebury's characteristically keen interest in the linkages between one life and another, notably between insects and the flowering plants they visit.

(3) We owe much to Lord Avebury for his ambitious endeavour to build up a comparative physiology of the senses of animals. And in addition to this inspiring vista, there were numerous concrete discoveries, such as the sensitiveness of ants to ultra-violet rays.

(4) Of importance also are his studies on the life-histories of insects and the problems of their metamorphosis. He also sought to utilise the life-history of the individual to throw light on the evolution of the race.

(5) Just as Darwin monographed barnacles, so Lord Avebury monographed the Spring-tails and Bristle-tails—a laborious piece of work carefully executed. There is no doubt that the author became intensely interested in these very minute insects; he was rewarded by making some notable discoveries in the course of his systematic work; and he reached some large conclusions that have stood the test of time, such as the separateness of the Spring-tails and the Bristle-tails. But while he and Zoology had such rewards, and while it was probably of value to him to have had this discipline in the school of Linnæus, we cannot but be glad that he did not do too much systematic zoology. His heart and his genius were elsewhere. As he said himself: "To watch the habits of animals, to understand their relations to one another, to study their instincts and intelligence, to ascertain their adaptations and their relations to the forces of Nature, to realise what the world appears to them—these constitute, as it seems to me at least, the true interest of Natural History" ("Senses of Animals," p. 193).

We have seen that Lord Avebury had what might be called a characteristically *dynamic* view of Nature. He did his share of anatomy and histology, species-making and classification, but what he cared for most was the creature *alive*. By calling his view of Nature dynamic we mean more than that he was interested in habits and activities than in form and structure. We mean that he saw the present-day system of animate nature as the outcome of a long process of evolution—the web of life changing its pattern from age to age; that he was profoundly impressed by the process of individual becoming—the emergence of the full-grown complex creature from the apparent simplicity of the egg; and that he had an unusually vivid appreciation of the march of the seasons and their never-ending pageant. It was not coldly but joyously that he studied the evolutionary, the developmental, and the seasonal movements.

What made Lord Avebury an enthusiast for what is called "Nature Study," and made him willing to give time and strength to promote it, was not merely his belief that young people should know more than they usually do about the world in which they are to spend their life; not merely that he believed there was a kind of discipline in the biological sciences that could not be got in any other way; behind both these convictions there was the strong desire to share with others what he had found to be an enrichment of life. And, if we have understood him aright, he had, as part of his creed, a definite belief, which grew with his strength, that through a patient, precise, and sympathetic study of common animals we may reach not only an inexhaustible pleasure, but a better understanding of ourselves and the conduct of our life. Meredith's words suggest themselves:

For him the woods were home and gave him the key
  Of knowledge, thirst for their treasure in herbs and flowers.
The secrets held by the creatures nearer than we
  To earth he sought, and the link of their life with ours.

Science has to keep emotion at a spear's length, but in our all-round outlook on Nature such severity of detachment is as impossible as it would be unwise. In our search after *Truth*—which means much more than accurate scientific formulation—there is a right of way marked by the signpost *Feeling*. It seems a reasonable position that we win some insight by Feeling—including, of course, the thrill that answers-back to beauty—which we cannot get in any other way; and this must enter into our interpretation of or total reaction to Nature. This was, we think, Lord Avebury's conviction. As an investigator he was scientific; as a man he had an emotional relation to Nature. And this was one of the chief joys of life to him.

Emerson advises us to strive after *an original relation* with Nature, and we venture to think that for Lord Avebury that was a relation of joyous fellow-feeling. He found naught common on the earth. This is not to be much spoken about, and it is perhaps better that we should be content here with illustrating it by a simple incident communicated to us by his daughter, Mrs. Grant Duff, who edits this volume.

"Our old home, High Elms, was covered with ivy, with the result that we constantly met earwigs in our sponges and other inappropriate places. A lady staying in the house had experienced one of these encounters, and exclaimed at breakfast: 'Oh! how I hate earwigs!' My father turned to her very gravely and said: 'I assure you that you are making a great mistake. They are most excellent mothers.' The lady responded, however, that she thought that made things worse."

There is no doubt that Lord Avebury attained to a

"Love exceeding a simple love of things
That glide in grasses and rubble of woody wreck."

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Lord Avebury was President of the Selborne Society from 1893 until his death (1913), and delivered many presidental addresses to this and other scientific societies which we have not space to enumerate.

Neither is it possible to make the foregoing list of papers complete.

VII

ENTOMOLOGY (*ANTS*)

By H. St. J. K. Donisthorpe, F.E.S., F.Z.S.

Of all the varied scientific work undertaken by Lord Avebury his researches on ants are probably the most important. It is therefore somewhat remarkable that his first paper on this subject was not published until 1874, when he was forty years of age. We cannot now determine the circumstances which first led him to begin these researches, but he was probably inspired by the fact that ants are the most interesting insects in the world, with highly specialised instincts and habits, suggesting so many fascinating problems for investigation. Moreover, he himself remarks: "I had intended to make my observations principally on bees; but I soon found that ants were more convenient for most experimental purposes, and I think they have more power and flexibility of mind. They are certainly far calmer and less excitable."[1]

Avebury's work consisted, not so much in a description of the usual habits of ants, as in testing their mental condition and the acuteness and range of their senses. With this object in view he invented and carried out many elaborate, ingenious, and painstaking experiments, often of a very laborious nature and necessitating hours of continuous observation. It is no exaggeration to assert that all the numerous experiments on the psychology of ants devised and conducted in more recent times are based on his original researches.

It may be mentioned here that two later observers, when discussing the supposed sense of direction in insects, wrote: "Sir John Lubbock, in dealing with the sense of direction in ants, concluded, after a number of observations, that they are endowed with this sense in a high degree. Subsequently he discovered, quite accidentally, that the ants found their way by observing the direction in which the light was falling." His conclusion was, however, far from accidental, being the result of many observations carried on under varied conditions.

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[1] "Ants, Bees and Wasps," 1882. Preface, p. vii.

Although Avebury did not attempt any complete description of the habits of ants, his works do nevertheless give a very fair outline of their life-history and general habits as exhibited by the different families, in many parts of the world, as well as in Britain. In some of his earlier papers he dealt very thoroughly with the anatomy of ants; his dissections, and the exquisite drawings by which they were illustrated, having never been surpassed. Of his numerous discoveries, inventions, and improvements in connection with the study of ants, it will be sufficient to direct attention to the following points:

He was the first observer to attain precision in the course of an experiment by marking particular insects; to confine ants between glass plates containing earth; to observe ants' nests for long periods; to keep individual ants alive for many years; to witness the foundation of a colony from the egg; to produce females in captivity; to prove that the eggs of Aphides were carried by ants into their nests for the winter, and, when hatched in the spring, taken out and placed on their proper food-plants; that ants are sensitive to the ultra-violet rays of the spectrum; to discover organs of hearing in the legs of ants; to notice the association with ants of certain Diptera and mites new to science, and a species of Collembola; to describe two new Honey Ants, etc., etc.

In order to obtain a careful record of the actions of individual ants it became necessary to mark them so that they could be immediately recognised after they had joined their fellows. For this purpose Avebury marked them on the back with a small spot of paint. He found that ants required somewhat more delicate treatment than bees or wasps, but that with a little practice they also could be marked without any real difficulty.

His method of keeping colonies of ants in captivity between glass plates is very ingenious. These nests in their original form, and with modifications, are in use at the present day and are always spoken of as "Lubbock" nests. After trying various plans, he found that the simplest and most convenient nests were made from two plates of common window glass, about ten inches square, held apart at a distance of from one-tenth to one-quarter of an inch, by slips of wood round the edges, the intermediate space being filled up with fine earth. He also devised various means of fixing a number of these nests on one stand; for keeping them moist and dark; for inducing a colony of ants to take possession, etc.

It is a remarkable testimony to the advance brought about by his methods that, whereas no earlier naturalist had succeeded in keeping a colony of ants for more than a few months, he had them under constant observation for many years. It used to be the general opinion that individual ants, including queens, lived for only a single year. Avebury, however, not only identified workers of two species of ants (*Lasius niger* and *Formica fusca*) which were at least seven years old, but he also kept alive two queens of the latter species for more than thirteen and fourteen years respectively.

Before his investigations, the manner in which a colony of ants was founded was quite unknown, nor had any previous observers, although they had kept female ants in confinement, been able to demonstrate that an isolated female could rear her young to maturity. He, however, proved by experiment that the queens of certain species possessed the instinct of bringing up larvæ, and the power of founding colonies.

On August 14th, 1876, he isolated two pairs of *Myrmica ruginodis* which he found flying in his garden. He supplied them with damp earth, food, and water, and they remained perfectly healthy throughout the winter. In April one of the males died, and the second in the middle of May. The first eggs were laid between April 12th and 23rd, and began to hatch during the first week in June; the first larva turned into a pupa on the 27th of this month, the second on the 30th, the third on July 1st, by which time seven other larvæ had hatched and two eggs had been laid. *July 8th*—Another egg appeared, and a fourth larva pupated on the same day. *July 11th*—Six eggs were present. *July 14th*—About ten eggs. *July 15th*—One of the pupæ began to turn brown and the eggs were about fifteen in number. *July 16th*—A second pupa began to turn brown. *July 21st*—A fifth larva had become a pupa, and there were about twenty eggs. *July 22nd*—The first worker emerged, and a sixth larva had pupated. *July 25th*—A young worker was carrying the larvæ about, and a second worker was coming out. *July 28th*—A third worker emerged. *August 5th*—A fourth worker present.

The cause of the production of queens and workers in ants is still a subject of uncertainty and discussion, viz. whether their production is already predetermined in the structure of the egg, or brought about by the stimulus of food supplied to the larvæ. It was formerly believed that eggs laid by workers invariably produced males, but this has been recently disproved. Avebury expressed the opinion that he could not but believe that ants possess the power of developing a given egg into either a queen or worker. Great numbers of workers and males came to maturity in his nests, but, with a single exception, no queens were ever produced. This exception was the first record, and still remains one of the *extremely* few known cases, of queens developing from eggs laid in captivity. Five queens appeared in a nest of *Formica fusca* (possessing a queen-mother) which had been under observation from April 1897 for a period which ensures that the eggs must have been laid in captivity. Avebury suggested that this remarkable exception might have been caused by nutriment, for the nest had been richly supplied with animal food.

It had been known that certain dark-coloured eggs of Aphides were to be found in ants' nests, and that the ants carried them into safety when their nest was disturbed. Avebury, however, proved that these eggs did not belong to the species of Aphides which live on subterranean roots in the nest themselves, but to plant-lice that feed on the young shoots of daisies and other plants outside the ants' nests. After several unsuccessful attempts to rear the young Aphides which hatched from the eggs, he finally in 1879 attained success. The eggs, which he had placed in one of his nests of *Lasius flavus*, commenced to hatch during the first week in March. Near this nest was a glass containing living specimens of several species of plants commonly found on, or around, ants' nests, and to these plants some of the young Aphides were brought by the ants. Thus the whole history became clear. The Aphid eggs, which are laid early in October on the food-plant of the insect, are taken into their nests by the ants and tended by them all the winter, and in the following March, when the young plant-lice hatch, they are again brought out and placed on the young shoots of the proper species of plant. As he justly remarked, here was an instance of prudence unexampled in the animal kingdom.

No earlier naturalist had made any experiments in order to determine the limits of animal vision, with the exception of those carried out by Professor Paul Bert on a Crustacean. Avebury turned to account the avoidance of light exhibited by ants in their nests in order to test experimentally how far they are capable of distinguishing colours. For this purpose he covered his nests with screens of coloured glass, coloured solutions, etc., employing green, yellow, red, and violet, and after numerous experiments, in which the ants always avoided the violet screens, he deduced the following conclusions: that ants have the power of distinguishing colours; that they are very sensitive to violet; and that their sensation of colour must be very different from our own. He next conducted various experiments with the spectrum, chemical solutions, etc., and demonstrated that ants perceive the ultra-violet rays.

All observers agree that ants are unable to hear sounds that are very apparent to ourselves, and some consider that they are quite deaf. Avebury, who tested these insects in a variety of ways and with the shrillest noises, without effect,[1] nevertheless carefully abstained from the inference that they are really deaf, but suggested that their range of hearing is very different from ours. This would seem the more probable, as ants are known to stridulate and to possess organs specially constructed for this purpose, as well as others regarded as auditory which reside in the antennæ, etc. All of these were figured and described by him. He furthermore discovered an auditory organ in the tibiæ of ants—a situation hitherto unknown except in Orthoptera, and considered to be peculiar to these among all insects, and indeed all Arthropoda.

Avebury discovered two species of Diptera associated with ants—*Platyphora Lubbocki* and *Phora formicarum*—both new to science, and the former belonging to a new genus. The first of these two flies, a male, was never taken again until 1904, some twenty-seven years after the original discovery. The female, which is wingless, was not discovered until 1891, and at the time no one realised that it belonged to the same species, or even to the same genus as the male, which had received the name of *Aenigmatias blattoides.* It was the present writer's good fortune to be able to prove that these two insects, which seemed to be so utterly different, were the sexes of the fly first discovered by Lord Avebury. The second species, *Phora formicarum*, possesses very interesting habits. It is parasitic on certain species of ants, and Avebury observed that when an ants' nest was disturbed some of these small flies would probably be seen hovering over it, every now and then making a dash at some particular ant and laying an egg on it. The larvæ which hatch from these eggs live as parasites within the body of the ants. In later years his observations have been abundantly confirmed by the study of this fly.

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[1] When the writer tested the hearing of ants with the Whistle known as the Galton-Edelmann, he experienced the same result.

He was also the first to observe several species of Acari, or mites, in his observation nests and also in the field. The mites were found fastened on to the ants, and free in the nest. One of these latter, *Uropoda formicariæ*, which he found in some numbers in nests of *Lasius flavus*, was new to science.

Avebury was the first to record the occurrence in ants' nests of a small blind species of Collembola, which he named *Beckia albinos.* He speaks of it as an active bustling little being, running about in and out among the ants, with its antennæ in a perpetual state of vibration: and he kept hundreds, and sometimes thousands, of it in his various nests. It has since been found to occur with very many different species of European ants.

He described two new species of Honey Ants, both of which were sent to him from Australia, the first being a Camponotus, to which he gave the appropriate name of *Camponotus inflatus.* The second, *Melophorus bagotti*, belonged to a new genus. He pointed out that, although in these ants a similar habit has been evolved, and a modification in the structure has been produced similar to those of the well-known Honey Ants of the genus *Myrmecocystus* of Mexico, etc., the similarity cannot be due to descent one from another, or from a common ancestor. There is no escape from the conclusion that the modification has originated independently in the Mexican and Australian species. As this subject is both interesting and important, it may be as well to give a short description of Honey Ants. As is well known, many ants are in the habit of collecting honey-dew and storing it in their crops, until they become distended, and when they reach the nest they feed their brood and other members of the colony by disgorging the sweet liquid. Ordinary ants prepared for this duty may often be seen returning home with the abdomen much distended. Now in the Honey Ants this habit has been developed until a special class of worker has been produced. In these "repletes," as they are called, the bodies are enormously swollen: in fact, they are literally "honey-pots." The size and rotundity of the abdomen are not due to the stomach, but the crop, which, being filled with honey, forces back all the other organs against the walls of the abdomen, which are stretched to their utmost extent. The ordinary worker is a quick and graceful creature, but the repletes, or "honey-pots," are able only to waddle along. The replete form is confined to certain workers, and can be produced only from the soft and pliable "callows," newly hatched from the pupa. Later on the integument of the body becomes hard, and they are unable to be formed into "honey-pots." This has been proved in observation nests by feeding callows with maple sugar and other sweet liquids which they greedily devoured, some of them becoming semi-repletes, whilst others acquired the complete rotundity of the genuine "honey-pot." Although it is chiefly the larger workers that serve as "honey-pots," the smaller ones sometimes play this part. The "honey-pots" never leave the nest, but store the sweet liquid received from the other workers which go out to forage for food. In return they disgorge some of their store when the other workers require to be fed. They are thus the living casks, or barrels, of sweet stuff, kept by the ant colony as a store in time of want. They live a quiescent life, hanging from the ceilings of subterranean chambers in the nests. They can move about a little, but should they fall from the ceiling they are unable to regain their former position without assistance. There are often as many as three hundred "honey-pots" in the chambers of a large colony.

This short résumé of some of the principal discoveries for which we are indebted to Avebury's admirable original work may appropriately close with the fine word picture in which he compares the stages of social advancement reached by the various species of ants with those passed through by man: "One may almost fancy that we can trace stages corresponding to the principal steps in the history of human development. We find in the different species of ants different conditions of life, curiously answering to the earlier stages of human progress. For instance, some species, such as *Formica fusca*, live principally on the produce of the chase. These ants probably retain the habits once common to all ants. They resemble the lower races of men, who subsist mainly by hunting. Like them, they frequent woods and wilds, live in comparatively small communities, and the instincts of collective action are but little developed among them. They hunt singly, and their battles are single combats, like those of the Homeric heroes. Such species as *Lasius flavus* represent a distinctly higher type of social life: they show more skill in architecture, may literally be said to have domesticated certain species of Aphides,[1] and may be compared to the pastoral stage of human progress—to the races which live on the produce of their flocks and herds. Their communities are more numerous: they act much more in concert: their battles are not mere single combats, but they know how to act in combination. I am disposed to hazard the conjecture that they will gradually exterminate the mere hunting species, just as savages disappear before more advanced races. Lastly, the agricultural nations may be compared with the harvesting ants. Thus there seem to be three principal types, offering a curious analogy to the three great phases—the hunting, pastoral, and agricultural stages—in the history of human development."

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[1] Most ants "milk" plant lice, and in some cases it is their chief food.

Before closing this chapter on Lord Avebury's work in connection with ants, it may not be out of place to relate the following incident as an instance of his invariable kindness, and the importance he attached to the fulfilment of a promise to help a fellow worker. The writer's library had for many years included various works by Lord Avebury—"Ants, Bees and Wasps," "Prehistoric Times," "The Senses of Animals," "The Scenery of England," etc., several of which had been kindly presented to him by their author; but he did not possess, and was unable to obtain, some of the earlier papers on Ants. Lord Avebury, when appealed to for help, replied, although he was unwell at the time, promising to see what he could do when he was better. His letter was written, alas, in his last illness, and he passed away on May 28th, 1913. A few days later a letter was received from his Secretary, enclosing "the papers on Ants, as promised"—a complete set of all the earlier works.

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VIII

BOTANY

By Dr. A. C. Seward, F.R.S., Master of Downing College, Cambridge.

As stated in the Preface, the aim of this book is to give a general impression of Lord Avebury's life-work, his character, and personality. The object is not merely to direct attention to the extraordinary variety of the problems in which he was interested, but to demonstrate from his writings the nature of the guiding principles and motives which they reveal. His botanical work, whether published in scientific journals or presented in a more popular form, admirably illustrates Lord Avebury's attitude towards Nature: his passionate desire to know, his determination that others shall share with him the good things which are available to all who make plants their friends, and a conviction that even the most insignificant structural features serve some definite purpose.

It is interesting to recall that in April 1865 Sir Joseph Hooker wrote to Charles Darwin: "I gnash my teeth when I think of Lubbock going into Parliament"; and in another letter: "I grudge so good a man from science, and have a presentiment that it will inaugurate a very trying life for him." In a similar strain, and in the same year, Darwin wrote to Hooker: "I am heartily glad you like Lubbock's book so much ["Prehistoric Times"]. It made me grieve his taking to politics, and though I grieve that he has lost his election, yet I suppose, now that he is once bitten, he will never give up politics, and science is done for. Many men can make fair M.P.s; and how few can work in science like him." Before the events had happened which produced these gloomy forebodings, and so splendid a testimonial from his two friends, Lubbock had shown his ability as an original investigator in Entomology and in other branches of Natural Science, but he had not published anything on Botany. It was inevitable that a strenuous political life very seriously interfered with continuous original research; but his scientific output was remarkable and his influence on the spread of natural knowledge, both through his own observations and the skill with which he made accessible and stimulating to others—especially lovers of Nature who were not trained biologists—the results of botanical research, was far greater than either Darwin or Hooker conceived possible. It is only just to point out that in his books Lord Avebury acknowledges substantial help from Dr. Rendle, the present Keeper of the Botanical Department of the British Museum, and many other botanists, as well as from his own assistants, but it was his genius which devised experiments and directed the observations of others as well as his own; it was he who gave the lectures and addresses, and wrote the articles and books for which both professional botanists and thousands of amateurs have either expressed or felt sincere gratitude.

"It seems Nature's temper," as Mr. Fuller Maitland has aptly said, "to grudge no trouble in the setting up of sign-posts, and, having set them up, to blindfold the travellers who pass by ways so furnished with guides to knowledge." Lord Avebury more than most men read Nature's sign-posts, and, whether he read correctly or incorrectly, he travelled with wide-open eyes; advancing age did not materially diminish his enthusiasm or his capacity to react to the spiritual influence of living things. He was throughout life imbued with the student's determination to discover a reason for all that he saw, whether it was something exceptional or something so familiar and obvious that to most men it would make no appeal.

"Nature fills the heart," he wrote, "not only with joy and wonder—but with gratitude." He lived up to the maxim of the late Bishop Creighton—"The one real object of education is to leave a man in the condition of continually asking questions." His writings are free from positive assertion unsupported by proof. "Every fresh discovery reveals new sources of wonder, every problem that is solved opens others": his solutions of problems are tentatively advanced with the knowledge that further work may lead to a change of view. "Apart from moral causes," he wrote, "success or failure in life depends as much on observation and on the power of weighing evidence as upon any other quality." His object was to bring prominently before readers "how rich a field for observation and experiment is still open to us." Lapse of time has not rendered Seneca's words inapplicable to the present—"we imagine that we are initiated into the mysteries of Nature; but we are still hanging about her outer courts."

As President at the Jubilee meeting of the British Association at York in 1881, a position which bears striking testimony to the appreciation of his scientific contemporaries of his devotion to Natural Science, he said: "When we were young we knew that the leopard had spots, the tiger was striped, and the lion tawny; but why this was it did not occur to us to ask; and if we had asked no one could have answered." In these words we have a concise expression of the dominating factor in his work. He saw, admired, and wondered, and then exercised his ingenuity and his highly developed powers of observation in seeking an explanation of things which to most of us are what they are because they are. The encouragement of the spirit of enquiry is in itself a solid contribution to the scientific education of a nation: if the desire to wrest from Nature her secrets becomes a dominating influence an important step has been taken towards success in original investigation. Lord Avebury's contributions to Botany include much that is new and of permanent value; the facts are presented with a conciseness and a clarity that are not invariably noticeable in the writings of professional men of science. His keenness as an observer, his ingenuity in devising experiments and suggesting explanations, and his ability to deal with technical subjects in a language that is both intelligible and attractive to the layman, are qualities which enabled him to exert a wide influence as an investigator and an exponent. Darwin in 1862 asked Lubbock to assist him by watching hive-bees sucking clover flowers: "Though I know how busy you are," he wrote, "I cannot think of any other naturalist who would be as careful." On this particular occasion Darwin found that he was on the wrong track, and next day he wrote: "It is all an illusion. . . . I hate myself, I hate clover, and I hate bees."

Though he did not take a very prominent part in the controversies which followed the publication in 1859 of "The Origin of Species," Lord Avebury's botanical work was greatly influenced and inspired by the views of his friend and neighbour at Down. He was in close touch with Darwin; he freely discussed problems with him, and saw experiments in progress. In a letter to Mr. William Darwin dated the day before Charles Darwin was buried in Westminster Abbey he wrote: "I esteem it a great privilege to be allowed to accompany my dear Master to the grave."

To many temperaments the beauties of Nature make only an æsthetic appeal; the true image of the blue of heaven reflected in the petals of the Speedwell stirs emotions of intense pleasure, the shape of a leaf excites admiration by the curve of its lines; but more to know does "never meddle with" their thoughts. To a keen appreciation of beauty in Nature he added an overmastering desire to understand the purpose underlying form and structure. To him plants were not only living organisms; they were almost human. "I really think," he said, "that my first feeling would be one of delight and interest rather than of surprise if some day when I am alone in a wood one of the trees were to speak to me."

On another occasion he said: "The life of a tree is often compared with that of a man—not always to the advantage of the latter"—

> Your sense is sealed, or you should hear them tell
> The tale of their dim life, with all
> Its compost of experience: how the sun
> Spreads them their daily feast,
> Sumptuous, of light, filling them as with wine.

He never tired of questioning the trees and herbs, and felt for them an affection and a companionship which made him almost forget the barrier between himself and them.

Flowers and Insects.

At the meeting of the British Association at Belfast in 1874 Sir John Lubbock gave an address on "Common Wild Flowers considered in Relation to Insects," and in the following year was published the first edition of his widely read book "On British Wild Flowers considered in Relation to Insects." He wrote in the Preface: "It is not without much diffidence that I venture on the present publication. For, though as an entomologist I have necessarily been long familiar with our common wild plants, I had made no serious study of Botany until recent researches brought prominently before us the intimate relations which exist between flowers and insects. My observations and notes on this subject were originally prepared with the view of encouraging in my children that love of Natural History from which I myself have derived so much happiness, but it was suggested to me that a little book such as the present might perhaps be of use to others also." With his customary caution and in the spirit of the scientific enquirer who realises the importance of proof, he added: "Many of the observations have not yet stood that ordeal of repetition which they will no doubt experience." One of the recent publications to which allusion was made was no doubt Darwin's paper on the two forms of flowers in Primula, a contribution of exceptional interest and importance of which Darwin himself said: "I do not think anything in my scientific life has given me so much satisfaction as making out the meaning of the structure of these plants." In this branch of Natural History Lord Avebury was especially interested both as entomologist and botanist, and his own researches, particularly those on the colour sense of insects, played an important part in laying the foundations of an accurate knowledge of the Biology of Flowers. His book is valuable not only because it contains original observations and many facts culled from sources not readily accessible to the ordinary reader, presented in a form that is intelligible to laymen ignorant of botanical terminology, but because of the stimulus which it gave to lovers of Nature to widen their horizon, to think of flowers not simply as specimens to be collected and named, but as delicately adjusted mechanisms exhibiting a marvellous range in their adaptation to insect visitors.

The study of flowers in relation to insects was no new science: but since the earliest observations were recorded, the subject had been almost completely neglected for nearly a century until Darwin's researches demonstrated its importance and gave to it a new significance. As long ago as 1761 Joseph Gottlieb Kölreuter had pointed out that the visits of insects are necessary to many flowers; he was amazed that "Nature had left so important a matter as reproduction to a mere chance, to a fortunate accident." His amazement was gradually converted to admiration of the means employed by flowers to attract insects. Occasionally, he wrote, one may observe "how a few of the insects roll about in the pollen, how they cover the whole of their body with it, and how in their golden costume they carry the fertilising material in bulk to the female flower." A few years later Conrad Sprengel raised the Biology of Flowers to a very high level. Unfortunately, for himself at least, this naturalist became so enthralled by his observations that he neglected his duties and was compelled to relinquish his post as Rector of Spandau. Like many other good men, Sprengel was unable to preserve a strict sense of proportion between the discharge of duties and the attractions of a hobby. It is easy and comforting to make time-tables by which to regulate one's activities: adherence to them is quite another matter. Few men have the strength of mind, the self-control, and the habit of usefully employing odd moments which enabled Lord Avebury to accomplish what he did.

Sprengel was convinced that "the wise Creator of Nature has brought forth not even a single hair without some particular design." This intense belief in teleology—the conviction that there is some purpose underlying every form and every structural detail—was in some degree shared by Lord Avebury. In his Presidential Address at the British Association meeting at York he said: "New glimpses of the truth are gradually revealing themselves; we perceive that there is a reason—and in many cases we know what that reason is—for every difference in form, in size, and in colour; for every bone and every feather, almost for every hair." Sprengel believed that each flower was created in the form in which he saw it: a view, as Lord Avebury said, which prevented him from perceiving the real significance of the facts that he had discovered, "while the true explanation could hardly have escaped him if he had possessed the higher view of creation which we owe to Mr. Darwin.

Though a firm believer in the scientific views of his friend Darwin, Lord Avebury shared with Sprengel the conviction that some useful purpose is served by structures that seem to be meaningless. The view which assigns a distinct *rôle* for each floral form, each shade of colour, and sees in the darker lines and spots of colour on the lighter ground of a petal guides to insects in search of honey, has less support now than at the time of the publication of Lord Avebury's book. The earlier work of which he gives an admirable summary, and the experimental investigations on the relation of insects to flowers with which the name of Lubbock is associated, paved the way for the more searching experimental methods which are now being employed. In illustration of the more intensive, modern method of studying the relations between flowers and insects reference may be made to the work of Professor Fritz Knoll which is in course of publication by the Zoological-Botanical Society of Vienna. As science advances and brings us nearer to a knowledge of the causes which determine organisation and form, we are apt to belittle the achievements of the pioneers who were influenced by the prevailing opinions of the day. The older faith in teleology has lost much of its force; it is no longer an axiom that every detail, if we only knew it, has a meaning that is purposeful. The enthusiastic naturalist seeking for explanations of the possible utility to an organism of even the most insignificant features was often led to conclusions that are now discarded. While it is important to recognise this, it is equally important to emulate the spirit of devotion shown by the earlier investigators. We may no longer hold the faith they held, but we share with them the desire to discover Nature's laws.

The researches of Darwin and those of many other workers in the same field received full acknowledgment from Lord Avebury. A short glossary of technical terms, wisely placed at the beginning of the book, enables the non-botanical reader to follow with ease the admirably lucid descriptions. In the Introduction the author deals generally with the relations between insects and flowers, and by brief descriptions the student's interest is awakened and he is prepared for the more detailed systematic treatment of the families of Flowering Plants represented in the British Flora. The method adopted is thoroughly sound from an educational point of view. In order to appreciate the meaning of a natural system of classification it is more important to be familiar with the characters of several members of a single family than to acquire a superficial acquaintance with many families. An examination of a series of flowers of plants included in the Buttercup family shows that there is a wide range in colour, in the shape and structure of the flower, and in the degrees in which the floral mechanism exhibits adaptation to different kinds of insects; whether, for example, the honey is accessible to many kinds of visitors or is attainable only by a certain type of insect. There is a striking diversity of plan combined with constantly recurring features of organisation which are believed to be indicative of descent from a common ancestor. The nectar secreted at the base of the petals of a Buttercup is freely exposed, and may be reached by small and large insects, while in the Larkspur it is produced in long and narrow prolongations of two petals concealed within the spur of a sepal. In Clematis the flowers have no honey and are visited for the sake of the pollen. Moreover, comparison of the many familiar flowers of the Buttercup family shows that the same end is achieved in a great variety of ways: the attractive colour may be in the petals, the sepals, or the stamens;

the position of honey-secreting glands varies considerably; in some plants the stamens and pistil are mature at the same time and self-pollination is easy, while in others means are adopted for securing cross-fertilisation. The method of presentation followed by Lord Avebury brings out very clearly these and other facts, and encourages readers to make observations for themselves. Much stress is laid on the importance to the plant of cross-pollination, that is, the fertilisation of its female cell through the agency of pollen from other flowers of the same species. Darwin's experiments had led him to express the opinion that Nature abhors perpetual self-fertilisation, and this conclusion was generally accepted. Observations and experiments that have since been made have demonstrated that in a large number of flowers self-pollination is the rule. As knowledge increases the point of view changes: each generation provides a starting-point for the next. Lord Avebury's main object was to create a wide interest in a fascinating subject, and to encourage naturalists to study flowers in the field as living organisms presenting innumerable problems for solution, and in this he was eminently successful. His descriptions are concise and easy to follow, and, whether or not subsequent research has modified his conclusions, the existence of an intimate relation between insects and flowers which he emphasised is an undoubted fact.

In endeavouring to form a just estimate of the value of the book under consideration we must take into account the part it played nearly half a century ago in providing thousands of readers with a new interest in life and, incidentally, in spreading a sympathetic appreciation of the value of scientific research. "It is not, I think, going too far to say that the true test of civilisation of a nation must now be measured by its progress in science." This opinion, expressed by Lord Avebury, is perhaps more widely accepted now than it was in his day.

National progress in Science is due not only to the sustained efforts of a comparatively small band of investigators; it also depends very largely upon the sympathetic attitude towards scientific methods and aims on the part of the public. One of the greatest services Lord Avebury rendered by his publications was to make plain to the layman the aims and conclusions of specialists, and to show that it is within the capacity of us all to do something to advance natural knowledge.

A paper entitled "Notes on Pollen" read to the Royal Microscopical Society in 1912, the last of Lord Avebury's botanical contributions, may be appropriately mentioned in relation to the subject of flowers and insects. The author began by giving a brief account of the development of pollen from the mother-cells within the anther, their subsequent germination on the stigma, and the production of the minute tube which grows—in some flowers it may be a distance of several inches—before reaching its destination and eventually transfers the male sperms to the cells within the ovule and thus effects fertilisation. The author's main object was to give the results of a comparative examination of a large number of plants and to discover whether any conclusions could be drawn with reference to a correlation between the size of the pollen grain and the length of the pistil. For many of the measurements acknowledgment is made to his "excellent assistant," Mr. Fraser. This paper, which has not received the attention it deserves, is one of the few sources available to botanists who desire data on the form and size of pollen.

Fruits and Seeds.

"We all know that seeds and fruits differ greatly in different species. . . . We may be sure that there are good reasons for these differences."

The study of flowers and the methods of pollination naturally led to the consideration of the structures which are the end of reproduction. Avoiding technical terms as far as possible, Lord Avebury explained the series of changes involved in the production of fruits and seeds; he showed how plants provide for their offspring by a legacy of food and by the protection of the germ within the seed. He illustrated, by selected examples, the diverse methods by which fruits and seeds are disseminated, always endeavouring to explain peculiarities of form and structure by reference to the needs and circumstances of the plant. By a comparative treatment of different categories it is shown that the same end is attained by a great variety of means—the brightly coloured hip of the Rose, the conspicuous, fleshy, and sharply contrasted fruits of the Mulberry and Plum are familiar examples of edible fruits which owe their dispersal to animal agency and adopt different methods of rendering themselves attractive. In the hip the edible portion is the enlarged urn-shaped axis of the flower; in the Mulberry the small sepals become fleshy and sweet; in the Plum it is the enlarged wall of the carpel. "If seeds and fruits cannot vie with flowers in the brilliance and colour with which they decorate our gardens and our fields, they rival them in the almost infinite variety of the problems they present to us, in the ingenuity, the interest, and the charm of the beautiful contrivances which they offer for our study and admiration."

Leaves.

In the book on "Flowers, Fruits, and Leaves" the last section is devoted to a consideration of the structure and especially the forms of the common every-day leaves of our woods and fields. The intention is to emphasise the marvellous variety in the shapes and sizes of foliage leaves, and to discuss possible explanations. Most people are able to recognise an Oak leaf, but few notice that the two sides are unequal or ask themselves why the edges are deeply indented. It is often assumed that "there is some special form, size, and texture of leaf inherently characteristic of each species; that the cellular tissue tends to crystallise, as it were, into some particular form, quite irrespective of any advantage to the plant itself." To Lord Avebury the shape of a leaf is a problem to be solved; it is the expression of the plant's reaction to the circumstances of its life, and in many instances he finds a probable clue to the nature of this correlation between organisation and environment. The present form of some leaves may, as he points out, be a legacy from the past and not explicable by any present requirements of the plant. What, he asked, is the advantage of the palmate form of leaf (a leaf resembling the outspread human hand)? Is it a later or earlier product of evolution than the heart-shaped type? He believed that the cordate form, with its less efficient means of distributing sap through curved veins, preceded the palmate leaf in which the conducting channels pursue a straight course.

As the embryo of an Oak leaf grows within its small bud, and becomes too large for the space at its disposal, it bends. A leaf that has a margin without indentations or lobes would be thrown into folds as it bent in the bud, but the deep sinuses on the edge of the Oak leaf obviate the necessity of folds on its surface and facilitate accommodation in the restricted chamber that encloses it. A young Oak leaf is not only curved but is wrapped round the still younger leaves within it: one side is folded within the other; the outer side occupies more space than the inner. When the leaf emerges from the bud it is seen that the central rib divides the green surface into two unequal portions. In the opinion of one of the foremost botanists of to-day (Professor Goebel of Munich), "to recognise the factors which bring about the development of say a leaf with one side larger than the other is infinitely more important than to construct a phylogenetic hypothesis (*i.e.* an hypothesis concerning relationships and descent) unsupported by facts."

A Beech leaf has an area of about three square inches: the leaf of a Spanish Chestnut is much longer than that of a Beech, but it is relatively narrower. It may be said that each of these plants has an inherent tendency to assume its particular shape. To be told that plants are what they are because they cannot help it does not satisfy the student of Nature who wishes to get to the bottom of things. The modern tendency is to discover the ultimate cause of form and structure, to penetrate within the living cell, and to detect the physical and chemical factors which influence the developing organs. Lord Avebury, while recognising that his explanations of form were but partial and tentative, concerned himself mainly with analysing the interdependence of form and the needs and circumstances of the plant. The size of a leaf, he argued, is closely related to the thickness of the stem. In the Spanish Chestnut the stem is nearly three times as thick as that of the Beech; it can carry a larger leaf-surface. But, on the other hand, the distances between its buds only slightly exceed the interval between those of the Beech. The Spanish Chestnut leaves develop the larger area which their stronger stem can support by growing in length and not in breadth. In this connection it must be remembered that the arrangement of leaves on shoots and their form bear an intimate relation to their function. When viewed from the direction in which light falls upon a tree the foliage is seen to resemble a green mosaic; the green pieces are so disposed that each receives its full share of sunlight and is therefore so placed that it can most efficiently entrap the rays which provide the energy necessary for the essential part which the leaves play in the life of the plant.

Leaves are extraordinarily plastic organs; the readiness with which they respond to the stimulus of the environment, their size, their texture, the shape of the blade, their hairiness or smoothness, vary within wide limits even in the different members of a family or in species of the same genus. By studying them in reference to their setting, as Lord Avebury clearly shows, we learn to regard them as parts of a complex living machine adjusted in innumerable ways to varying conditions of existence.

Stems.

From a consideration of the forms of leaves it is an obvious step to the forms of stems. In a paper read to the British Association at the Cambridge meeting of 1904 Lord Avebury discussed the reason for the occurrence of square, triangular, and polygonal stems in addition to the more usual round stem. A good many years ago a German botanist, the late Professor Schwendener, drew attention to the fact that plants dispose their strongest tissues in a manner best calculated to enable them to offer the maximum resistance to bending and other forces acting upon stems, roots, and leaves. As Lord Avebury said: "Plants have worked out for themselves, millions of years ago, principles of construction so as to secure the greatest strength with the least expenditure of materials, which have been gradually adapted to the construction of buildings by the skill and science of our architects and engineers." An upright stem exposed to the force of the wind will be stretched on one side and compressed on the other, while between the two sides there is a neutral region. The stem will best resist bending if the strongest parts of its body are situated as far as possible from the neutral axis. If the pressure acts in all directions the stem which is circular in section will be the most efficient. Why then is the round stem not universal? Lord Avebury pointed out that all British plants with quadrangular stems have opposite leaves, and, he added, plants with opposite leaves generally have stems that are quadrangular in section. In the Nettles, for example, the stem is square in section and the leaves are borne in opposite pairs, each pair at right-angles to those above and below. By square stems the strain of the wind is felt mainly in two directions. If a transverse section of the stem of a White Dead Nettle is examined under the microscope it is seen that the strongest tissue is concentrated close to each of the four angles; in other words, the stem is provided with two I-shaped girders. Similarly, plants with stems that are triangular, such as the Sedges, carry their leaves in threes. It is interesting to note that in the beautifully preserved, petrified leaves of strap-like form belonging to one of the common trees of the Coal Period—an age separated from the advent of man by many millions of years—the strengthening material is disposed strictly in accordance with the principles of sound construction which were re-discovered by us "afterthoughts of creation."

Buds and Stipules.

In a series of fully illustrated communications made to the Linnean Society Lord Avebury gave the results of a comparative examination of buds and stipules, demonstrating, as was his invariable practice, the range in form illustrated by these organs, and always seeking and offering explanations. He subsequently published a book entitled "Buds and Stipules" as a volume of the International Scientific series. The large, conical bud at the tip of a branch of a Horse Chestnut is encased in an armour of brown scales, cork-covered and water-proof, their efficiency as protective structures being increased by a sticky, resinous substance which is secreted on their inner faces and exudes from between the overlapping edges. On removing the outer scales, which serve as roofing tiles to the rest-house in the winter and early spring, we discover similar though more delicate, light green scales; and further penetration reveals a few pairs of leaves reproducing in miniature the lobed, hand-like form of the adult foliage and covered with a thick down of white hairs, like small woollen gloves. In the centre of the bud, if it is one of the stouter buds at the tip of a branch, and occupying the summit of the short axis of the embryo shoot which lower down bears the tightly packed woolly leaves, there is a cluster of unopened, ball-like flowers resembling a tiny bunch of grapes: this is an immature spray of blossom ready to expand and to stretch when the signal is given. The tree lays the foundations of the shoot of one year in the preceding season; the delicate parts need protection, especially against loss of water from within. When the time of awakening arrives the plates of the protecting cover are forced apart by the pressure of the expanding axis, which gradually emerges above the tips of the scales that have served their purpose.

It needs no botanical knowledge to enjoy the beauty and perfection exhibited by a Horse Chestnut bud. There are countless forms of buds differing widely in every particular, yet all serving similar offices. The black, flattened buds of the Ash, the light-brown, tapered buds of the Beech covered with spirally disposed overlapping scales, the buds of the Plane tree hidden in the hollow of the covering leaf-base: these and many other examples are described and closely questioned on the subject of their differences. The protection of buds is considered at length, as it clearly illustrates the variety of devices employed even by plants that are closely related. Lord Avebury also draws attention to the influence that buds exercise on the methods of branching of trees: in some trees, such as the Scotch Fir, the main axis continues to elongate each year; the expansion of the terminal bud adds to the length of the stem of previous years which retains its place as leader. In other trees the bud at the summit of the shoot falls off or fails to develop, and its place is taken by a branch produced from the lateral bud nearest the apex—a method that is well illustrated by the Elm, the Lime, the Hornbeam, and other trees.

Special attention is devoted to the leaves of the Tulip tree characterised by a truncate apex, like a wide-open V, instead of the spear-like, pointed termination of the otherwise similar leaves of the Sycamore. The explanation of this peculiar form which is suggested is based on an examination of the folded leaves in the bud. The leaf does not conform in its shape to that of the bud, but to the unoccupied space that is available, and this space can best be filled by the arrested development of the apex and the growth in breadth of the rest of the leaf.

A comparative account of the structure of buds necessarily involves consideration of stipules. As a Beech leaf discards its winter covering it is easy to see that at the base of the stalk there are a pair of small leaflets which soon fall off as the main part of the leaf reaches maturity. These are stipules. In some plants they persist; it may be as green wings on the edge of the leaf-stalk as in the Rose, or as comparatively large green blades as in the garden Pea. The imbricate scales which cover the small clustered buds of the Oak and the long smooth buds of the Beech are stipules that have precociously developed to serve as coverings of the buds in which the other portions of the leaves are still hidden from view. Stipules are integral parts of a leaf, though they are by no means always present: they appear under many different guises, as thin green leaflets, scales that soon fall off, or occasionally as stiff, pointed thorns. They are usually small and may easily be overlooked, but like other inconspicuous parts of plants they deserve careful study and must be treated as units of a complex association:

> Who looks
> In steadiness, who hath among least things
> An undersense of greatness; sees the parts
> As parts, but with a feeling of the whole.

Early in the nineteenth century Professor Vaucher of Geneva called attention to the fact that the leaves of some kinds of Rock Rose have stipules, while those of others have none, and he suggested that it would be interesting, if possible, to ascertain the reason for this difference. Lord Avebury's sense of adventure was roused and he determined to attack the problem. After carefully examining different species of Rock Rose (Helianthemum) he came to the conclusion that some have stipules for the protection of the buds, while in other species this purpose is served by the dilated base of the leaf. Having dealt with the Rock Rose, he extended his researches to other stipule-bearing plants, and added substantially to our knowledge of a subject that had not previously received much special attention.

Seedlings.

The two volumes entitled "A Contribution to Our Knowledge of Seedlings" are dedicated to Sir Joseph Hooker, "by whose researches botanical science has been so greatly enriched, and to whose friendship I owe so much." For botanists this book is the most useful and original of Lord Avebury's contributions to the science. It was seen through the press, as were some of the other books, by Dr. Rendle; the author also expresses his indebtedness to the Director of the Royal Gardens, Kew, to Mr. Lynch, who was then Curator of the Cambridge University Botanic Garden, and to other Botanists for much of the material examined. A more popular edition was published as a volume of the International

Scientific Series. Six years before the Seedling book appeared the author, on the invitation of the Vice-Chancellor of the University, delivered the Rede Lecture at Cambridge and chose for his subject "The Forms of Seedlings and the Causes to which they are due."

The elementary student of Botany is usually introduced at an early stage of his career to the subject of the germination of seeds, the factors governing the awakening into active life of the embryo after a short, or it may be a long, period of quiescence, and the stages by which the seedling gradually acquires the habit of the tree or herb. The value of Lord Avebury's volumes lies in the wealth of material described and admirably illustrated, and in the ingenious and generally successful attempts to throw light on the almost infinite variety of form exhibited by seedlings of different plants. The book contains a more complete account of seedlings than any other work in the English language, and is constantly used by botanists in search of information on this important branch of the subject. The author's object was not merely to trace the development of as many plants as possible in their passage from embryo to adult; his main purpose was to ascertain the causes which produce the striking diversity in the form assumed by the seed-leaves while still enclosed in the seed and later when they appear as the first green blades on the young stem.

If we cut open the seed of a Broad Bean we find that it is entirely occupied by the embryo consisting of two swollen cotyledons, or seed-leaves, gorged with starch and attached, one on each side, to a short and diminutive axis, one end of which represents the primary root and the other develops into the ascending shoot. When germination occurs the root-end of the embryo, responsive to the stimulus of gravity, and forced downwards by the elongation of the expanding cells, bores its way through the soil, while the other end of the axis responds in a different way to the stimulus of gravity and makes for the light. Pending the time when the young root and shoot are able to play their part unaided in the nutrition of the plant, the energy which makes growth possible is supplied by the store of food in the cotyledons. As the reserve food is transferred to the cells of the actively growing organs the cotyledons, which remain below the surface of the ground, gradually shrink and are eventually discarded. This type of germination, in which the cotyledons fill the cavity of the seed and never see the light, is illustrated by many familiar plants. In another type of seed the space within the protecting coat is occupied by a store of food outside the embryo and not in the cotyledons. It may be noted in passing that Lord Avebury, in describing seeds of this type, speaks of the reserve food outside the cotyledons as perisperm, instead of adopting the generally accepted term endosperm. By perisperm botanists understand a store of food found in a few seeds external to the true endosperm. The cotyledons, when relieved of the duty of storing food, are thin and delicate films lying face to face with the short axis of the embryo fixed to the base of each, as in the seeds of the Castor oil plant. On germination the cotyledons are gradually drawn out from between the split seed-coat; the axis of the seedling, fixed by the root in the ground, and temporarily held at the other end by the cotyledons that have not yet left the seed, bends into a loop as its length increases; as the bending becomes more pronounced the pull on the cotyledons gains in strength until they are lifted above the ground and spread their green surface to the light. Between the clearly distinguished methods of germination represented by the Broad Bean and the Castor oil plant there are various intermediate types.

The cotyledons, of which there are two in the great majority of flowering plants, known as Dicotyledons, in contrast to the single cotyledon of the Monocotyledons, are generally very different in appearance from the true foliage leaves which succeed them; but they are none the less leaves. In closely allied plants they may assume very different forms. "Mustard and Cress were the delight and wonder of our childhood, but at that time it never occurred to me at least to ask why they were formed as they are, and why they differ so much."

In most accounts of seedlings no attempt is made to discuss the causes which determine the various forms of cotyledons. Lord Avebury was especially interested in discovering the reasons for the apparent vagaries in the size, shape, and position of the cotyledons within the seed. He showed that the embryo of some plants has unequal cotyledons because its position in the seed favours the development of one more than the other. In certain plants the two halves of the same cotyledon are unequal: in some Geraniums this is explained by the manner in which the cotyledons are folded; in Laburnum it is the result of an inequality in the two sides of the seed. The cotyledons of the Cleavers or Goosegrass (*Galium aparine*) have at first a complete tip, but this is afterwards replaced by an apical depression: the explanation given is that the production of a small terminal gland prevents further growth at the apex. The cotyledons of the Lime tree, in the small seed within the ovoid fruit, are broad and five-lobed. As they increase in size they press against the sides of the imprisoning wall and bend back on themselves. If, adds Lord Avebury, one takes a teacup and tries to place in it a sheet of paper, the paper is thrown into ridges. If the ridges are removed and so much paper is left as will lie smoothly inside the cup, it will be found that it has been cut into lobes resembling those of the seed-leaves of the Lime. It has, however, been pointed out that while the lobed form facilitates packing in the seed, it is also advantageous because it increases the efficiency of the cotyledons as organs concerned with the absorption of food. Attention is drawn to the fact that plants such as the Cabbage or the Pea with large embryos germinate much more rapidly than those with small embryos.

Some seeds that are narrow contain embryos with narrow cotyledons, *e.g.* those of the Plane tree and the Ash, but on the other hand in many broad seeds the cotyledons are also narrow. It is shown that in the broad seeds the cotyledons generally lie transversely. There is no constant relation discernible between the size of a plant and that of its cotyledons.

In a general review of Lord Avebury's botanical contributions it is impossible to do adequate justice to the observations, and the inferences drawn from them, recorded in the book on seedlings. The conclusion reached is that the form of the embryo, and especially that of the cotyledons, is essentially influenced by the shape of the seed. The long narrow straps of the Sycamore rolled into a ball fit closely into the more or less spherical seed; the nuts of the Beech are triangular, and an arrangement like that in the Sycamore would be unsuitable because it would leave gaps in the seed-cavity; the cotyledons of the Beech are therefore folded like a fan and fit beautifully into the nut. Though it is admitted that there are some cases in which adaptation to purpose is not obvious, the author expresses the opinion that his comparison of the numerous forms examined reveals "an almost inexhaustible series of beautiful adaptations to purpose."

The Life-history of British Plants.

In order to identify wild plants it is necessary to make use of a Flora, a book that is purely descriptive in the treatment of the several genera and species, and does not attempt to deal with that aspect of botany which is often spoken of as the Natural History or Biology of plants. In the volume entitled "Notes on the Life-history of British Flowering Plants" an attempt is made to supplement the information given in Floras. Differences in structure, form, and colour are as far as possible explained and some of the innumerable problems awaiting solution are clearly stated.

The familiar John-go-to-bed-at-noon (*Tragopogon pratensis*) is said in some parts of England to close its flowers with a punctuality which satisfies farmers' boys as a guide to their dinner-hour. Lord Avebury states that his own observations show that the opening and closing of the flower-heads is very gradual and much more dependent on the weather than would be possible in a satisfactory substitute for a clock. Facts quoted from others as well as first-hand observations are interspersed with descriptions of the more striking features and adaptations exhibited by British plants. "Perhaps no branch of Botany is more interesting," he wrote, "than the manner in which plants adapt themselves to circumstances. The reasons suggested are in some instances more or less hypothetical. . . . To many, indeed, systematic botany is the most interesting department of the science; to others it is the entrance to the inner court of the temple; and when we realise that for every shade of colour, for all the exquisite beauty of flowers, for the endless difference in size, forms, and textures of leaves, for the shape and colour of fruits and seeds, there are, if we only knew them, good and sufficient reasons, Nature seems endowed with new and vivid life, with enhanced claims on our love, wonder, and devotion."

Many references are given to botanical literature, and the book covers a wide range of subjects—the structure and pollination of flowers, some aspects of plant anatomy, buds, leaves, seedlings, plant movements, and other topics. The impression made by this, his last botanical book, is that Lord Avebury was addressing himself primarily to readers interested in purely systematic Botany with the desire to encourage them to study plants from a wider standpoint. Systematic Botany is essential as a foundation for all solid work on the manifold relations which exist between plants and their environment, and it is a subject which in this country at least has suffered neglect. By opening up new interests and suggesting fresh trains of thought, Lord Avebury hoped to give the mere collector a wider outlook, and to induce him to regard the identification of plants in the field as a preliminary—and an important preliminary—to enquiries into their relations to one another and their resourcefulness in meeting the exacting demands of the different worlds in which they live.

Conclusion.

The annals of scientific research include the names of a few men endowed with qualities which give their personalities exceptional power to attract not only students who are themselves engaged in the pursuit of natural knowledge, but also the layman whose imagination is stirred by attributes that are not necessarily associated with scientific distinction. Among such men, to mention only two, Lord Lister and Pasteur are familiar examples.

Louis Pasteur, pre-eminent among a select body of investigators who have demonstrated the possibilities of scientific research, possessed not only ability to discover the secrets of Nature, far surpassing that of the great majority of his fellows, but also a simplicity and kindliness of heart which compel affection. It is this combination of an overmastering desire to learn and the longing to add to the sum of human happiness which appeals to most of us. No one with a reasonably developed sense of proportion would go so far as to compare Pasteur, a master in research, with one whose chief work was not scientific—and indeed to suggest such comparison would be unjust to him whose contributions we are considering; yet there is an analogy in their outlook on the world.

Lord Avebury, as his friends Darwin and Hooker have told us—and they were competent judges—was an original investigator of high promise. He chose a path in life remote from that of the professional man of science; but the desire to know persisted as a potent and active factor. He preserved throughout life the spirit of a seeker after truth; and, making full allowance for the work done by others under his direction, the amount accomplished by, and through, him compares favourably with the output of some whose occupation is exclusively botanical. To persuade others to share his intimacy with Nature, to draw from her the inspiration and solace which he did, was, perhaps, his highest aim. An omnivorous reader of good literature, Lord Avebury realised the danger of the "worship of book-learning." He wished children to cultivate a taste for reading in order that "our national history and poetry may be a source of legitimate pride"; he also desired them to love Nature "so that every country walk may be a pleasure." He shared the conviction expressed many centuries ago by Saint Bernard—"Believe me who have tried. Thou wilt find something more in woods than in books. Trees and rocks will teach what thou canst not hear from a master."

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IX

EDUCATION AND LETTERS

By Sir Michael E. Sadler, K.C.S.I., Master of University College, Oxford.

In his writings on education John Lubbock is of the lineage of John Locke, Joseph Priestley, and Richard Lovell Edgeworth. Like them, he was observant, unsystematic, serene; a diligent teacher of diligence; naturalist and lover of letters; learned but quick to unlearn; never looking at life through smoked glass. Like theirs, his service to English education was many-sided, stimulating, and fruitful, because his view of the subject was wide, practical, humane. Put together what he wrote about education, trace the threads of his influence, and you find, perhaps a little to your surprise, that on self-culture and on early preparation for the self-culture of later years no English writer of his time is more typical of the progressive and cultivated thought of the Victorian age.

I

The most characteristic English writing on educational subjects has concerned itself mainly with the aims and methods of self-education and with the choice of the subjects which should be taught to children, especially in early years at home, with a view to what Locke called the conduct of the understanding amid the discipline and the distractions of life. In Montaigne and in Goethe most Englishmen whose thoughts turn to education find something more congenial than in Rollin or Herbart.

Lord Avebury takes his place in the English tradition. That tradition is attractively unpretentious, racy, idiomatic: but unsystematised, and full of gaps. It has the weakness as well as the safety of being unphilosophical, even deliberately unphilosophical. And yet, underlying its cheerful stoicism and sturdy distaste for the abstract, there is after all something like a philosophy, toughly rooted in concealed presuppositions. This is true, I think, of the working of Lord Avebury's mind on educational questions. He wrote no systematic treatise on the fundamental principles of education. To an American or Continental compiler of the list of authors who should be included in a Cyclopædia of Education his name might not occur on first thought. Yet he is not only entitled to a place in such a work, but is a representative writer among the Englishmen of his time. His books are full of shrewd and enheartening maxims on educational subjects. The topic was constantly in his mind. He was equipped with special knowledge of many parts of it. What he wrote implied a philosophy, and was coloured by presuppositions lying deep in his mind. The advice which he gave to Everyman came fresh from his own experience. He had felt what he said before he said it. Throughout his life he was busy educating himself. And what had helped him he was happy in asking others to share. For all of us life leaves many fragments of time. Lord Avebury had found that we can gather up the fragments in baskets-full.

In his Parliamentary and other public labours he gave unfatigued attention to educational problems. He seized opportunities, especially on Royal Commissions, of acquainting himself with what was going forward in elementary and secondary schools and in Universities. He realised, not least from the happy memories of his childhood, how momentous are the issues at stake in the earlier stages of education. Consistently he pleaded the claims of physical science to a place in the programme of what is taught. Not less consistently did he lay stress on the importance of training children to observe Nature, to love good books, and to use their mother-tongue with skill and care. He saw the problem of education as a whole, mainly from the standpoint of parents and of those pupils who show energy in self-education. But he did not forget the importance of adjusting the mechanism of school studies to the intellectual and social needs of the rising generation, nor did he overlook the part which the teacher must take in showing us what there is to learn and in keeping before us a high standard of accuracy and thoroughness. It was not, however, on the tightly knotted questions of school-curricula that his attention was fixed. His tastes and experience led him to take a more general view. He preferred to write about education with the freedom of a man of letters and of affairs. He saw the whole wood, not only the thick screen of near trees. But there is a difficult side of school-craft about which he said little.

Lord Avebury addressed his main effort to the task of inculcating a generous doctrine of self-culture and to securing conditions of commercial employment which would give to men and women leisure for study and observation. To him education was not a specialised subject, but one of the chief threads in the web of life. Having overcome a proneness to depression, he had a happy mind and wished others who might suffer from discouragement to learn the secret of serenity. With unflagging industry he had practised self-culture. His opportunities had been of a kind which few men are so fortunate as to enjoy. But he believed that all men and women may find opportunities for self-education if they have eyes to see and the will to use them. Even poverty and ill health, he was glad to think, are no bar to wisdom and serenity of mind. Scant schooling has never shut out intelligent and painstaking people from the good things which self-education can give. He liked Gibbon's remark that every one receives two educations: the education which he gets from other people and the education which he gives to himself; and that of the two the second is the more important.

II

Charles Darwin once wrote to him: "How on earth you find time for all you do is a mystery to me." From boyhood, Lord Avebury had the business man's instinct for not wasting time. The Victorians learnt the value of minutes from knowing the cost of labour in large offices and in factories. The business-like side of Lord Avebury's mind showed itself in thrifty use of moments of leisure, in the power of turning quickly from one subject to another, in guarding himself against waste of nervous energy through impatience at inevitable interruption, in the habit of diligently taking notes as aids to memory, and in trying to get a clear idea of what he was aiming at when he made an effort of the mind. This last habit, which is the habit of a man of business, helped him to define educational aims with a precision not always found in writings on that subject. His other business-like qualities enabled him to accomplish an amount of work which is surprising in its volume and impressive by its variety. But, as happens with many other men of business, his liking for definiteness of aim exposed him to the danger of pigeon-holing some conclusions which, if they had been allowed to float in his mind and even to decompose, might have become a ferment of new thought, coalescing with other ideas in new and suggestive combinations. His mind was acquisitive rather than creative. Quotation from his note-books choked the flow of his own thoughts. As a writer he is at his best when he is least studded with extracts from other men's writings. It was in fact his modesty of mind that led him to employ quotation to excess. But also a feeling of gratitude. Great books set fire to his feelings, and he wanted others to warm themselves at the same flame. St. Paul's injunction, "Owe no man anything," made him a little over-punctilious in acknowledging literary obligations. If he had been less business-like in making extracts from what he read, he would have written better books; if he had shut up his extract books, like his old ledgers, he would have given us more of himself.

The tradition of painstaking and of punctuality has made business life the strongest educational influence in the training of many Englishmen. From his youth onwards Lord Avebury was exposed to it, and owed to it much that makes his work impressive and characteristic. But in his nature there was another and very different vein. He had not only system but sensibility. This sensitive, self-questioning, delicately unselfish side of his temperament was the source, not perhaps of his success, but of his power of winning the affection of friends and of gaining what was not far from the affection of countless unknown readers. We feel in his books the spirit of sympathy. It shows itself in his disposition to give encouragement to the discouraged and consolation to the sad. There were two aspects of Lord Avebury's mind; one he had acquired through the discipline of business, but the other drew its beauty from inner goodness and from self-abnegation.

Perhaps we may go so far as to say that in Lord Avebury two temperaments were conjoined, and that what is most characteristic in him came from the blending of two different sets of qualities in one nature. There was tenderness in him, but also a certain hardness. At first sight it might appear that the harder elements were dominant in his temperament. But the most lasting impression which he made, both by his writings and in personal intercourse, was due to shy tenderness of heart and mind. Charm is fragrant in what he wrote. The tender side of his inheritance had a more permanent power of imprint than the more masterful side of his nature, which at times seemed to force the other into recession. It may sound like a paradox, but in Lord Avebury, whose most obvious characteristics of mind and habit were markedly masculine, there was a feminine strain of much rarer and more exquisite quality, and it was this which gave the finer values to his feelings and thought. In his writings about education and self-culture there is something which women, and not men only, feel to be addressed to them and to spring from an experience like their own.

In the first chapter of this book Mrs. Grant Duff describes the background of her father's early life. That background gave colour to his after-thoughts on education. The Edgeworths themselves could not have bettered the training which he received from his mother and father, especially from his mother, during those early years at home. He and his sister grew up like Harry and Lucy in the Edgeworths' tale. John, though allowed to follow his bent, was never for an hour neglected. Freedom and stimulus were combined with observant discipline. He was not five years old before he showed the beginnings of his life-long delight in insects. But he had also to put his mind to mathematics, for which he had no such aptitude, under the direction of his father, who did not possess the mother's skill and tact as a teacher and, though beloved, was the formidable element in that happy and affluent Victorian home. The children were fortunate. Their parents never spoilt them, but could give them the best opportunities for growing up healthy and self-disciplined, versatile, unconceited, and alert. It was one of those English homes, in the country, but with part of the year in London, where the child-study, which we owe to the Edgeworths and ultimately to Pestalozzi and Rousseau, was blended with devout and dutiful Evangelicalism. Of this the nursery handbook was Mrs. Sherwood's "Fairchild Family." A grave but sunny religious atmosphere pervaded the boy's home life. "John is exceedingly fond of flowers, and I expect he will be a botanist," his mother wrote in her diary when the boy was four. She might have added. "I think he may grow up to be a clergyman." Harry Fairchild, if he had had a taste for poetry, might have written John's early verses. They show how fond he was of trees and flowers, but reflect the natural piety which he saw at home. His first effort at composition was a sermon. And when his childish mind raised, as a child's mind will, some of the questions which are the beginnings of metaphysics and philosophy, he found a foothold in his mother's quiet thoughts about the first and last things. Easy circumstances do not breed self-indulgence when those who live in them have in their minds the wide horizon of a great belief.

What Lord Avebury did afterwards for education was influenced, more perhaps than he knew, by these early years of home-training. He was a born teacher, naturally kind to creatures weaker and younger than himself; affectionate, sensitive, and, though not priggish, disposed to be didactic. He had diligence and a clear mind. His eyes twinkled with merriment and good-humour. But he knew what it means to be lonely and dejected. As a grown man he remembered what a sensitive child feels, and that a whole day may be darkened by an angry word. To the end of his life he was happy with children and took pains to make things interesting and memorable to them, just as his parents had put themselves to trouble for him and had taken him when a tiny boy to see the procession when Queen

Victoria was crowned. When he in turn became father of a family he was the friend as well as the mentor of his children. It was characteristic of him that he liked what he wrote to be clear enough for them to understand.

In early education, at its best, many large and difficult subjects are held, as it were, in a solution. They are not yet divided, as divided they must be in the school programmes which are designed for pupils of higher age, but must be blended together by the parents' or the teacher's skill. Their influence on mind and character is heightened by the intellectual and moral atmosphere of the home. Partly conscious, but largely environmental, this early education leaves a lasting mark upon thoughts and ideals. Love, with some fear, is the chief ingredient of it; Nature is the second; great books, and the thoughts which are engendered by good books, are third. It is not only the affluent who can enjoy the good things which home-education can give. Narrow means do not necessarily entail narrow minds. Early to learn the beginnings of things, under strict home discipline, but without drudgery and in an atmosphere of family affection, is a privilege which even *in angustis rebus* a child may enjoy. It was this good early training, this initiation, enriched so far as the pecuniary circumstances of the home allow, but never without a certain measure of austerity, that John Lubbock wanted all children to receive. Far indeed are most of them from receiving it in our day, as they were far in his. But he made it one of the chief labours of his life to smooth the way to their getting it. He thought always of education as first and foremost a parents' question, as something which the parent has to share in giving and to take pains in learning how to give. Thus Lubbock went to the heart of the present-day problem of national education. Perhaps it was his preoccupation with questions of home-training and of self-training that caused him, like almost all his contemporaries, to underestimate the magnitude of the problem which the inevitable cost of what we call "national education" has raised for the modern State. That a banker, closely interested in public revenue, should have slurred over in his thoughts the financial aspect of his most cherished reform is singular. His perspective was foreshortened. He was looking further into the future than he knew. His eyes were fixed on a national culture, not on the machinery for education which we hope, however doubtfully, may in the end produce a new national culture. That, if ever it comes, will be a work of art. The art of much of our preliminary educational organisation is at best the art of scaffolding.

No naturalist could have had a better preparation than Lubbock had for the scientific interests of later life. Charles Darwin came to Down when the boy was eight, and was his father's friend. Private school away from home from nine years of age to eleven roughened the lad a little, but gave him his first skill in games and could not extinguish the interests which continued to be fostered during holidays at home. At eleven and a half, Eton. It was, I suppose, the theory of the Eton authorities in those days that, apart from the culture which one may get from Latin and Greek, a boy could learn as much as he needed of arithmetic and foreign languages from private lessons out of regular school-time. In Chapter I, Mrs. Grant Duff has recorded the efforts made by Lubbock's father to get science into the Eton curriculum. His son never forgot his father's concern at this disregard of natural science in public-school education,[1] and I remember that, whenever I met Lord Avebury during my years of service at Whitehall, he urged me to do all I could to get some science taught to every boy in the public schools. But Eton days for Lubbock were short. He learnt much there that fitted him to play a man's part among men. But at fifteen years of age he was hard at work in the family Bank.

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[1] *Editor's note.*—In his will he left £1,000 to the University of London for an annual prize in Mathematics or Astronomy in memory of his father.

And now began the years of discipline and hard experience which tempered the steel in his character. The work which he achieved in later years for English education could never have been done as he did it but for the stern lessons of this apprenticeship to life. Enough is known of his inner trials, during years which to outward seeming must have looked gay and even debonair, for us to complete the picture of his training. As a youth, on the days when he had not to drive up to London to duties in the Bank, he worked hard, almost incredibly hard, at self-culture. There has been preserved a time-table of his plan of private studies, a mosaic of diligent and diversified application, which would have won praise from Dr. Smiles. He rose early and read hard before breakfast; gave his morning to natural science; his early afternoon to exercise; came back for political economy, followed by the relief of more science; and during an apparently dinnerless evening, broken by a game of whist, found time for patches of history, for mathematics, and, when his eyes were heavy with sleep, for German—which kept him awake. Thrifty use of his time Lubbock learnt at the Bank. Unlike almost every youth of his age, he set himself a standard of *improbus labor* during years when he might easily have become satisfied with doing what was required of him in his father's business. He had grown out of early delicacy, and had the physique for unremitting mental labour at a time of life when habits of industry or of slack-mindedness are chiefly formed.

What strikes one in this time-table of Lubbock's adolescent studies is the place given to religious reading.

The home atmosphere had taught him piety. But a new and penetrating influence had come into Down. This was the influence of Charles Darwin. Darwin liked the lad; discerned, as well he might, his great abilities; and made him a friend. Lubbock's love of Natural History was a bond between them and a firm foundation for friendship. Intimacy with Darwin was the crown of the young man's education. Darwin taught him method. What had been amateurish in Lubbock's standards changed into something much greater under the influence of Darwin's talk and example. He came under the spell of Darwin's mind. Imperceptibly but inevitably he saw things in a new light. Some of the formulas in which his religious intuitions had found expression, some of the doctrines of his strong religious faith, evidently began to seem too narrow for the facts. The sheath was falling away: his inner spiritual life burst the bonds of its first protective envelope: and Lubbock felt bare and lonely. There seems to have been no sudden crisis. Pascal's experience was not Lubbock's. Nor are there signs of the anguish which Arthur Clough suffered when he, like Lubbock, found the old formulas fading away from the unfading wish to believe. But quietly and irresistibly the change came in Lubbock's mind, and he was lonely.

He had the happiness, however, of knowing not Darwin only, but Darwin's friends. Their cordiality and courage saved him from depression and drew him into a circle full of eager life and fired with intellectual adventure. Lubbock found himself one of the bodyguard of Darwinism. Staunch with the staunchness of Huxley, he stood up against all who attacked what he knew to be true. The soldier-like instinct, the courage in defending unpopular conviction, which had been one of the marks of the Evangelical leaders, showed itself in his loyalty to Darwinism in the days of its unpopularity. Thus one of the deepest needs of his religious nature was satisfied by a cause which seemed to most of his contemporaries to be in conflict with revealed religion.

III

One of the most useful things which Lord Avebury did in his writings on education was to state what in his judgment we should aim at in each of its successive stages and as its final outcome.

"What qualities," he asks, "are essential for the perfecting of a human being? A cool head, a warm heart, a sound judgment, and a healthy body. Without a cool head we are apt to form hasty conclusions; without a warm heart we are sure to be selfish; without a sound body we can do but little; while even the best intentions without sound judgment may do more harm than good."[1]

A platitude, you say. Well, what else than a platitude was Locke's definition of the aim of education as *Mens sana in corpore sano?* It had been said before, but Locke's saying it again, with a mass of shrewd argument in support of it, fixed a new ideal on English education. Truisms, when timely, are to the point.

On what should be achieved by the education of a boy or girl up to fourteen years of age, he accepts as reasonable the description given by his great friend, Sir M. E. Grant Duff. The pupil should be able "to read aloud clearly and agreeably, and to write a large distinct round hand, and should know the ordinary rules of arithmetic, especially compound addition; should be able to speak French with ease and correctness, and should have some slight acquaintance with French literature; should be able to translate *ad aperturam libri* from an ordinary French and German book; should have a thoroughly good elementary knowledge of geography; under which are comprehended some notions of astronomy; should have a knowledge of the very broadest facts of geology and history—enough to make him understand, in a clear but perfectly general way, how the larger features of the world he lives in, physical and political, came to be like what they are; to have been trained from earliest infancy to use his powers of observation on plants or animals or rocks or other natural objects; to have gathered a general acquaintance with what is most supremely good in that portion of the more important English classics which is suitable to his time of life; and to have some rudimentary acquaintance with drawing and music."[1]

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[1] "The Use of Life," p. 53.

In another passage, which will be found in an address given by Lord Avebury at the University of Birmingham in 1903, he stated his view as to the range of knowledge which a boy should have, say at seventeen years of age, before he makes "any attempt to specialise." "He should have the power of speaking and writing English accurately; a fair knowledge of arithmetic and of mathematics up to quadratic equations; Latin enough to read Virgil and Horace with ease; some Greek, and one modern language; a general acquaintance with history, especially that of his own country; a good foundation in science, especially geography, geology, astronomy, chemistry, and physics; some power of drawing, which is almost as important as writing; and a knowledge of the elements of music."

To this he adds a characteristic and salient qualification: "You will say, perhaps, that this is rather a long list, and yet what subject could you omit? Of course in every subject you could not go far, but you might know the rudiments—you might have, not a smattering, which is useless, but a good foundation, which is most important."[2]

This is a wide-minded and generous view. With the drift of Lord Avebury's prescription most people will be disposed to agree. But as a practical guide to the educational administrator his remarks lose much of their value through his having failed to take into account another and inseparably connected factor in the problem. That factor is examinations. Every school in receipt of public money has to submit to examination by a public authority. Every profession requires its entrants to have passed an approved examination attesting the candidate's possession of a due meed of liberal culture. The desire therefore to pass the examination which entitles the successful candidate to such a certificate grows stronger and more general as the educational organisation of a country becomes complete. Examinations, however, are the test not only of the candidate's attainment but also of the assiduity of his teachers. The latter cannot afford to have many failures among the candidates whom they send up for the test. It is professionally their interest to prepare candidates to do well in the examination. But preparation for an examination is not necessarily the same thing as imparting the living power of liberal culture. And with more skilful preparation by the teachers the normal standard of attainment reached in the examination may rise without there being a corresponding advance in the real ability or intellectual activity of the pupils. Examination systems are masterful things. They catch into their machinery, and force into compliance, many teachers and many pupils who, were they left under less constraint, would give and receive a more liberal education. I am afraid that all our education is injured by the prevalence of examinations, though they are inevitable under our English conditions of public organisation. The pathology of examinations is a neglected branch of educational science. Lord Avebury threw no light upon it. The last thing of course that he meant to do, or would have liked to see done, was to cripple the spontaneity of creative ideas. But his formula for the liberal education which every boy should have received by the age of seventeen is so wide a formula and embraces so many branches of study that, if it were screwed down on schools by corresponding demands in the examination system, the result, though externally satisfactory, might mentally be hurtful to some of the minds in the rising generation.[1] Certain types of mind acquit themselves well in examination. Certain forms of ability are not injured by many-sided requirements. But some minds grow best without too much of the examination goad. Some temperaments are prone to worry overmuch under the impending shadow of an examination upon which distinction in a future calling seems to depend. Some natures submit too easily to what that great mathematician, Professor Whitehead, has called "the vicious implantation of inert ideas." As he says, and German experience is the best proof of the justice of his verdict, "the machinery of public administration is directed towards producing a good average of measurable efficiency—that is, efficiency assured by the measurement of inert ideas."

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[1] "The Pleasures of Life," Pt. I, pp. 188–9.

[2] "Essays and Addresses," p. 253.

Of all the problems of modern education, organised upon a vast scale, this is the most crucial. And it must be admitted that Lord Avebury did not foresee its imminence or contribute towards its solution.[2] But a debt of gratitude is due to him for his persistent and enlightened advocacy of a generous education. What he really cared for was a liberal atmosphere in home life, in schools, in individual study. A liberal education liberates. He wanted us to breathe a larger air. He knew that it would give us more life, a keener joy in living, a more vivid sense of well-being. Once get that more generous atmosphere and the worst dangers of an early concentration of intellectual effort disappear.

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[1] *Editor's note.*—He believed that young minds *require* a considerable variety of mental food.

[2] In one passage he came near to a diagnosis. Complaining in 1903 of the continued neglect of science in the great public schools, he remarked that the (as he thought) too narrow plan of studies was much more thoroughly carried out than had been the case sixty years earlier. "When I was at a public school we were much more left to ourselves. We had plenty of spare time. Idle boys were idle indeed: but those who wished to work could do so, and those who had special tastes could follow them up in leisure hours. Now, we may almost say, there are no leisure hours. Masters and headmasters are thoroughly in earnest: they throw themselves into their important duties with an energy and devotion for which we cannot be too grateful. In many respects our schools are all that can be desired. The general tone is excellent, the moral training is admirable, the boys are worked but not overworked, and a judicious amount of time is devoted to fresh air and exercise. But the very

Lord Avebury realised, as did few public men of his day, what elements should find a place in the culture of a widely educated man. One may say, perhaps, he saw an ideal for modern culture in the mind, attainments, and character of his friend, T. H. Huxley. He admired, as all who knew him could not fail to admire, Huxley's vivacity and candour, the vigour of his judgment, the many-sidedness of his knowledge, his artistic insight, the creative power of his mind, his courage and self-command, and, not least, his passion for science and his eye for the bearing of science on life. Individuality, expressing itself in personal independence of thought and in the public-spirited discharge of the obligations of citizenship, was Lord Avebury's ideal, and he saw that, under modern conditions, such individuality must be armed with science. It is evident that he valued the good side of those influences of corporate life which are now the most distinctive mark of English education. He did not underrate the importance of those elaborate activities which are designed to give us experience in bearing responsi-

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fact that the system is so thorough and so energetically carried out renders it all the more important that it should be complete" ("Essays and Addresses," p. 238). But Lord Avebury fails to ask himself what might be the effect upon the springs of the mind of the pressure of an examination system which made a many-sided demand upon a boy's powers of assimilation during adolescence. (He thought that a boy should do less grammar, and so make time for more congenial and educational subjects.—*Editor's note.*)

bility, and to teach us how to work with others for public ends, whether in leadership or in submission to the common will. But he distrusted regimentation, encroachments on leisure, the pressure of the herd. He wanted schools to have a stimulating intellectual air, charged with the oxygen of science.

IV

Lord Avebury served on three Royal Commissions charged with educational duties.

As a young man in his thirties he was appointed to the executive Commission which dealt with certain of the great Public Schools. This executive Commission was set up as a result of the report of Lord Clarendon's Commission which had enquired into the administration, management, and studies of Eton, Winchester, Westminster, Charterhouse, Saint Paul's, Merchant Taylors', Harrow, Rugby, and Shrewsbury. The gist of Lord Clarendon's report, published in 1861, had been to the effect that in their discipline and moral training the schools merited high praise; that their course of study, sound and valuable in its main elements, was wanting in breadth and flexibility—defects which in the Commissioners' judgment destroyed or at best impaired its value as an education of the mind; and that the schools, though in very different degrees, were too indulgent to idleness and consequently sent out a large proportion of men of idle habits and empty and uncultivated minds. Lubbock and his colleagues did their best to get the Public School curriculum modernised and widened, especially in regard to opportunities for the study of science.

Twenty years later, when he had passed middle life, Lubbock was appointed a member of Lord Cross's Commission on the working of the Elementary Education Acts in England and Wales. This Commission reported in 1888. Lubbock joined with Mr. Lyulph Stanley (now Lord Sheffield), Sir Bernhard Samuelson, Dr. Dale of Birmingham, Mr. Sydney Buxton (now Lord Buxton), Mr. Heller, Mr. Henry Richard, and Mr. George Shipton in signing a long minority report. The findings of this minority and the findings of the majority of the commissioners shared much common ground. But the minority stuck up for a more generous idea of the intellectual functions of elementary schools; emphasised the need for a higher intellectual standard in the professional preparation of teachers; advocated a substantial increase in the parliamentary grant in aid of elementary education; urged the need for reform in the methods of assigning pecuniary aid to schools; and deprecated what they felt to be the undue tenderness of the majority of their colleagues towards the needs and claims of denominational schools. The fundamental issue at stake was the aim, intellectual and social, of the elementary school in English life. The majority were fighting a rearguard action in defence not exactly of the *status quo* but of a too dimly formulated and increasingly unpopular ideal of elementary education for the masses of the people. The minority, temperate in their judgment and in the expression which they gave to it, represented a rising tide of public opinion, conscious of the inadequacy of the schools, irritated by the isolated and rather irresponsible character of the management of many of them, a little hesitant about the expense which would be entailed by any effective reform, and determined not to strengthen the privilege of denominationalism in English elementary education. The majority were hampered in their outlook by vested interests; the minority, by a certain want of courage in facing the expenditure and the social ideal implied in the educational policy to which they guardedly inclined.

How well prepared Lubbock was for serving on a

Commission to review elementary education is shown by an article which he had written in 1879.[1] In that paper he criticised the dryness of the schools under the sterilising influence of Robert Lowe's system of what was glibly called "payment by results" without sufficient thought to the kind of "results" to be aimed at. Don't regulate elementary education too minutely, Lubbock said: give it a closer connection with the realities of everyday life; pay much more attention to the teaching of the laws of health; don't stereotype the pattern of schools; encourage variety, freedom, educational initiative; get local authorities really interested in education; don't sacrifice education to instruction; don't choke a child's mind with a dry dust of facts; give him more delight in the beauties of Nature, more knowledge of animals and plants, teach him about the sun and the stars, light and heat; open out to him a source of enjoyment for leisure hours; so teach that every country walk may be a pleasure, that the discoveries of science may be a living interest to him, that he may love what is great in our poetry and be thrilled by the achievements of the heroes of mankind.

Of education, Lubbock said, the right thing to ask is: "Was the child happy while he was about it?"[2] "Many of the little faults, and some of the greater sins, of life are the result of dullness. Education should be so arranged as to make dullness impossible, to make life interesting and happy."[3] Education should be a door to joy.

"A great deal of nonsense," he wrote elsewhere, "is talked about the necessity of knowing things 'thoroughly.' No one knows anything thoroughly. To confine the attention of children to two or three subjects is to narrow their minds, to cramp their intellect, to kill their interest, and in most cases makes them detest the very thing you wish them to love."[1] "Two great faults in our present system of education," he said in 1902,[2] "are that it is too narrow and not sufficiently interesting. Children are inspired by the divine gift of curiosity. They ask more questions than the wisest man can answer. Their minds are bright, eager, and thirsting for knowledge. We send them to school, and what too often is the result? Their intellect is dulled and their interest crushed out. They may have learnt much, but they have too often lost what is far more important—the wish to learn."

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[1] "Addresses, Political and Educational," pp. 70 ff.

[2] "Essays, Political and Educational," p. 100.

[3] "On Peace and Happiness," p. 157.

Yet Lubbock was far from thinking of education as play. "Nothing," he wrote, "is more delightful than playing with children. To teach them is a different matter."[3] "The power of work has especially characterised our greatest men." Cecil said of Sir Walter Raleigh that he "could toil terribly."[4] Nor is education a passive process. We have to "rule our spirit" and to be masters of ourselves. "Be careful how you choose your thoughts."[5] Make your mind a nest of happy thoughts. But this means a constant effort after self-education. What are called "educational advantages" are not the only avenues to liberal culture.

He believed that through education England might see what Wordsworth longed to see—"joy in widest commonalty spread." He assumed, I think, an indefinite continuance of something like the economic order in which he had grown up. But he held that "in the earlier stages of education at any rate all men might be equal."[6] This trust in what true education might do for humanity was one of the grounds of his hope for the future. A well-educated people would avail themselves of the illimitable possibilities of science applied to life. Three special reasons he named as seeming to him fully to justify his belief in "the triumphal progress of science." "In the first place, continual improvements in our instruments and apparatus and the invention of new instruments of research; secondly, the increased number of workers; and thirdly the fact that, as the sunshine of discovery bursts through the clouds of ignorance, as the bright light of science pierces through the mist and mystery which surround us, so the possibilities of future progress are continually increasing."[1] But "the worth of a life is to be estimated by its moral value."[2] His ideal was "peace between nations, and for this moral instruction is an essential part of education."[3]

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[1] "Essays and Addresses," p. 245. [2] *Ibid.*, p. 262.

[3] "The Use of Life," p. 47.

[4] "The Pleasures of Life," Part II, p. 201.

[5] "Essays and Addresses," p. 279.

[6] "The Use of Life," p. 54.

V

The third of the educational Commissions on which Lord Avebury served (the second in point of time) was the least celebrated, but the ablest and most generally influential of the three. It was appointed in 1870 and reported in 1874 and 1875. Its reference was "to make enquiry with regard to scientific instruction and the advancement of science, and to enquire what aid thereto is derived from grants voted by Parliament or from endowments belonging to the several Universities in Great Britain and Ireland and the Colleges thereof, and whether such aid could be rendered in a manner more effectual for the purpose." The chairman of the Commission was the eighth Duke of Devonshire. Foremost among Sir John Lubbock's other colleagues was Professor Huxley. The other members were the Marquess of Lansdowne, Sir James Kay-Shuttleworth, Mr. (afterwards Sir) Bernhard Samuelson, Professor Sharpey, Professor W. A.

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[1] "Essays and Addresses," p. 260.

[2] "The Use of Life," p. 37.

[3] Address to International Congress on Moral Education, 1908.

Miller, Professor George Gabriel Stokes, and Professor Henry John Stephen Smith. The Commissioners reported unanimously that in Britain the assistance given by the State was inadequate; that the concession or refusal of aid did not take place on sufficiently well-defined principles; that aid should be given to private persons engaged in important physical and chemical investigations; that the advancement of science and the promotion of scientific instruction as an essential part of public education would be most effectively dealt with by a Ministry of Science and Education; and that the creation of such a Ministry was of primary importance. They suggested the establishment of a Council representing the scientific knowledge of the nation with a view to the Minister and other Departments of State being able to turn to it for advice in all cases of exceptional importance or difficulty.

What he heard and saw during his membership of this Commission made a deep impression on Lubbock's mind. He and his colleagues had reported "the present state of scientific instruction in our schools to be extremely unsatisfactory. The omission from a liberal education of a great branch of intellectual culture is in itself a matter of serious regret; and, considering the increasing importance of science to the national interests of the country, we cannot but regard its almost total exclusion from the training of the upper and middle classes as little less than a national misfortune."

Lord Avebury was throughout his life an untiring advocate of the introduction of science into all stages of education from the earliest years. He knew what good teaching is. He took no mechanical view of the subject. Of the art of science-teaching he thought and spoke as a master-craftsman thinks and speaks. He was no foe of the classics, but implacable against their privileged monopoly. He wanted the scientific spirit to permeate education and to influence the mind and habits of the people. Science was for him an essential part of a liberal education. It was part of the indispensable basis of technological training on a high plane. He desired that the school-stage of a liberal education should be steeped in science. He deprecated any early specialisation in technology. Though he did not ignore the commercial and industrial value of science, he never advocated it in a narrowly utilitarian spirit. He put its claims higher. "The study of Nature," he wrote, "is not only most important from a practical and material point of view, but will also do much to lift us above the petty troubles, and help us to bear the greater sorrows, of life. We live in an exciting, busy, beautiful, and delightful world, full of interest and promise. Beyond and all round in the far distance lies a vast, silent, and shadowy region, awful, mysterious, and to which we can imagine no limits. But as long as we keep the mind active, the heart pure, and the home happy with confidence and love, the mystery of the universe will have no terrors, and the spirit of peace will dwell with us."[1]

The labours of Lord Avebury and of men like him have borne fruit in English education. Very different now are the views of what should be attempted in a school for young children, of what the Sunday schools should offer and achieve, of the place of science in Universities, from the views which prevailed in England fifty years ago. The education of later life, to which Lord Avebury, like Jowett, attached high importance, is at last rising to something more like its right place in our perspective. The skill in teaching science to little children shown by Dean Dawes and Professor Henslow, and referred to by Lord Avebury as proof of what could be done, is now equalled by the skill of multitudes of teachers in all parts of the country. What that honoured veteran, Canon James W. Wilson of

[1] "On Peace and Happiness," pp. 261–2.

Worcester, did at Rugby is to-day far more widely achieved. Huxley's influence stamped itself upon the advanced teaching of many branches of science. In our educational outlook there has been almost a revolution.

To the Royal Commission on Scientific Instruction was entrusted the duty of surveying the educational field throughout Great Britain and Ireland. The commissioners therefore took a broad view of our national needs. They recommended that substantial capital grants, as well as annual grants towards the cost of maintenance, should be made to many of the British Universities. England is the only part of Great Britain in which this proposal for capital grants in aid of University development has not since that time been carried (at any rate to some extent) into effect. It is possible that Parliament may come to the conclusion that, in the interests of the learning and higher education of Britain and the Commonwealth, all the Universities, old and new, should receive capital grants for the extension of opportunities of study and research for men and women, graduate and undergraduate alike. The Universities are the key of the educational problem. Their responsibility, as Lord Avebury did not fail to see, is great.[1] Their resources, their equipment, should correspond to their responsibility

VI

Lord Avebury from boyhood believed in the educational value of open-air interests and country pursuits. Among his educational achievements, therefore, may be counted his success in persuading Parliament to institute what for a technical reason were called Bank Holidays for the enjoyment and relaxation of the people.[2] Not less important were his labours, crowned with success after patient endeavours extending over thirty years, to secure shorter hours for those employed in shops. For self-education a margin of comparatively untired leisure is essential.

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[1] "Lectures and Addresses," p. 263.

[2] Cf. "Life of Sir John Lubbock," by Horace G. Hutchinson, Macmillan, 1914, Vol. I, pp. 119–126.

The Ancient Monuments Act of 1882 was the outcome of a movement in national opinion originated by Lord Avebury.[1] In an article which he contributed to the *Nineteenth Century* in 1877[2] he pointed out that these monuments are part of the unwritten history of the country. They are treasures in the national tradition. In the interests of our culture as a people, and in some cases for artistic, in other cases for scientific, reasons, they should be preserved from vandalism and neglect. In the environment of national education elements of historic interest and of natural beauty should be preserved.

But Lord Avebury thought of education in its international significance as well as in the light of national duty. For this reason he gave what I remember to have been indispensable aid and support to the International Congress which met in 1908 in London, chiefly through the energy of Mr. Harrold Johnson and Mr. Gustav Spiller. In an address to the members of the Congress, who had assembled to consider moral education and moral instruction, he confessed that he was "far from satisfied with the state of education. There seem to me to be three great mistakes. It is too uninteresting. It is too narrow. It is directed rather to fill the memory than to form the character."[3]

Ethics Lord Avebury thought fundamental in education, because moral conviction is our anchor in life. He knew how subtle are the influences of example; how

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"Life of Sir John Lubbock," p. 168.

[2] Reprinted in "Essays, Political and Educational," pp. 154–174.

[3] Manuscript notes of Lord Avebury's address to the members of the Moral Education Congress, September 25th, 1908.

much our characters may be coloured by our environment; from how tender an age and almost unawares we learn to distinguish right from wrong; how quickly some minds are ruffled by contrariant feelings; how sensitive the young mind is to reality, yet how clumsy in defining principles and in analysing motives; how true it is that the heart may have reasons which the reason does not apprehend. He valued the English tradition of character-training, alike at home and at school and in the intercourse of life. He understood the reasons for preferring methods of moral education which are in the main indirect and incidental, and for continuing to use, so long as we may, traditional and time-honoured authority.

But none the less was he aware of the shortcomings of our English procedure in the moral training of children and young people. He saw how reluctant we are to think out, in their application to new questions of conscience or duty, the ethical principles implicit in our moral tradition. The needs of the elementary schools, in which the masses of the people receive their training for life, were never absent from his mind. He pondered over the ways by which the best influences of the older schools may be carried into the new. He wished the sense of social duty to be deepened, and the duty of happiness as well as the happiness of duty inculcated by precept and by example. He felt that the blades of conscience had to be re-set. He wondered whether some of the power of the older ethical tradition might evaporate under the influence of critical or disintegrating ideas.

Therefore he welcomed a strong growth of interest in the problems of moral education. He saw that the new movement in educational opinion which concerns itself with these questions is European. He was happy in finding with what respect Continental observers are disposed to regard the character-forming influences of

British schools. He was encouraged by the evidence that his own efforts to emphasise the moral, as well as the intellectual, side of self-education had been welcomed by a wide public. He knew that the day-school, which has its pupils for five hours in the day, has fewer opportunities of indirect moral training than the boarding-school, and that the day-schools are the prevailing type in modern State-aided education. He was aware that all over the world, though in most other countries more than in Britain, schools maintained or aided by public money are debarred from using some of the older vehicles of moral instruction. And by habit, as well as from experience, he believed in the straight word as a guide to duty.

VII

Thus, by his writings and addresses, Lord Avebury helped in diffusing that popular interest in education the growth of which has been one of the significant changes in public opinion during the last twenty years. In his books he endeavoured to show the place of education in life. He had the ear of a large public, and never missed an opportunity of reminding his readers of the value and duty of education. To many people his books were like the talk of a wise and experienced friend. He wrote with tonic power for those who were awakening to the meaning and value of culture. He was one of the best-loved lay-preachers of his time.

Loved as well as respected. For, when all is said and his work is viewed as a whole, what one comes to think the most important thing of all is the fact that he was a good man. His goodness made his influence great. *Victor sui*, he taught men and women to fight against their indolence and inertia and narrowness of mind. He showed them the better way. He gave them the materials of noble thoughts, and spurred them to put good and inspiring thoughts in place of thoughts which are mean and base. Perhaps he tried to do too much. But his many-sidedness made him a marked man, and his many-sided interests made him infectious. Many minds owe to his writings the stimulus which saved them from becoming mental slaves to routine. Liberal education, as he conceived it, is an education and self-education for liberty of heart and mind. After his contemporaries, Matthew Arnold, Ruskin, and Huxley, he was in his time the most widely appreciated English writer on education, and the most permanently valuable part of his educational writings deals with the Conduct of the Understanding.

Like Locke, he saw that "there are fundamental truths that lie at the bottom, and, like the lights of heaven, are not only beautiful and entertaining in themselves, but give light and wisdom to other things that without them could not be seen or known. These are the truths we should endeavour to find out, and store our minds with."[1] Like Joseph Priestley, he was preoccupied with the question of adapting education to the needs of men destined for, or engaged in, civil life. Like Richard Lovell Edgeworth, he had a deep insight into the significance of the training which children may receive in their early years. Like all three of these, his predecessors, he had a natural gift for scientific observation and a sustained love of it. Like them, he belonged to the Left-centre in English educational thought.

His contemporary, George Eliot, might have called him a meliorist. He belonged to a generation to which any kind of Calvinism seemed *de trop*. He stands in the brilliant sunshine which flooded England between two spells of stormy weather. And the gist of his teaching is in the Psalmist's words: "O that men would praise the Lord for His goodness, and declare the wonders that He doeth for the children of men. O that they would offer unto Him the sacrifice of thanksgiving, and tell out all His works with gladness."

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[1] "Conduct of the Understanding," § 43.

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X

SELECTIONS FROM LORD AVEBURY'S WRITINGS

In writing these books—of advice, encouragement, and appreciation—Lord Avebury was not aiming at literary achievement. His whole object was to express as clearly and simply as possible what he had to say. With this aim in view he often asked his children to read the proofs of his books, and to bring him any passage which was not clear to them, in order that he might explain it and also make it clearer for his other readers. He told them that he wanted every person of average intelligence to understand what he wrote, and that they could assist him enormously in achieving this. Again, where Lord Avebury found that his meaning had been supremely well expressed by another, he preferred to give a quotation, and hence some of his books bristle with inverted commas. Another reason for this was that he delighted in collecting these great and helpful thoughts and in reading them over for his own enjoyment and encouragement; and he believed that others, without the leisure to seek them at their source, would be equally delighted to possess them in an easily accessible form. His belief was immensely justified. Not only were new and cheap editions of "The Use of Life" and "The Pleasures of Life" constantly in demand in this country, but these works were translated into almost every language of the world and into many of the dialects of India, where they were used as class books for the teaching of English to little Indians. Millions of simple souls have found comfort and renewed courage in these pages which were never intended for scholars. One of their greatest charms is their complete freedom from pretentiousness.

"The Pleasures of Life" was first published in 1887. It grew out of speeches made over the foundation-stones of schools, public libraries, etc. Its popularity was almost instantaneous. The second part appeared less than two years later. "The Use of Life" followed in 1894, and "Peace and Happiness" in 1909.

He had also intended to write a book on Dreams, and for this purpose kept a note-book in which he wrote down all the more interesting of his own dreams. Apart from the fairly common sensations of flying or being chased by monsters, etc., he had very vivid impressions of strange and wild scenery. His dream experiences were sometimes very amusing. For instance, on one occasion Lord Haldane, upon having a young lady introduced to him by Mr. Asquith, "floated up the chimney, and after some interval came down again, covered with soot." Lord Avebury, however, gave up the idea of publishing such a book after the appearance of Mr. Horace Hutchinson's volume on the same subject.

In 1903 Lord Avebury published a volume of Essays and Addresses, which opens with an essay on "Huxley's Life and Work" and ends with an "Address to the Churchmen's Union." In this volume he reprinted those he considered most worth preserving out of the very large number of articles on various subjects which he contributed from time to time to British and foreign journals. These four or five books contain his opinions on the most vital subjects of life, as well as on those in which he was himself particularly interested. It has seemed that the best way to complete the portrait which the foregoing pages have drawn is to select some of these opinions, and to give them as much as possible in his own words. The ones chosen are those which appear the most characteristic both in matter and manner.

Science.

Since there are still people who maintain that the study of science is "materialistic," "merely mechanical" and "soul-destroying," the opposite point of view is of rather particular interest :—

"Science is of vital importance in our life ; it is more fascinating than a fairy tale, more brilliant than a novel, and anyone who neglects to follow the triumphant march of discovery, so startling in its marvellous and unexpected surprises, so inspiring in its revelations of the beauties and wonders of the world in which we live, and the universe of which we form an infinitesimal, but, to ourselves, at any rate, an all-important part, is deliberately rejecting one of the greatest gifts with which we have been endowed by Providence."—Rectorial Address, St. Andrews University, 1908.

"I should err indeed were I to dwell exclusively on science as lending interest and charm to our leisure hours. Far from this, it would be impossible to overrate the importance of scientific training in the conduct of life. . . . Science has assisted, if indeed it may not claim the main space, in sweeping away the dark superstitions, the degrading belief in sorcery and witchcraft, and the cruel, however well-intentioned, intolerance which embittered the Christian world almost from the very days of the Apostles. Science has purified and ennobled religion itself. . . . When we contemplate the grandeur of science—if we transport ourselves in imagination back into primeval times, or away into the immensity of space —our little troubles and sorrows seem to shrink into insignificance."—"The Pleasures of Life."

"It is, indeed, but a feeble expression of the truth to say that the infinities revealed to us by science—the infinitely great in the one direction, and the infinitely small in the other—go far beyond anything which had occurred to the unaided imagination of Man, and are not only a never-failing source of pleasure and interest, but lift us above all the petty troubles, and help us to bear the greater sorrows of life."—"The Pleasures of Life."

". . . Science, in addition to its value as a training for the mind, stimulates the imagination, in which, perhaps, we English are just a little deficient. We live in a world of mystery. . . . Every discovery which is made suggests fresh lines of enquiry, opens the 'door' and paves the way to still more marvellous and unexpected triumphs."—"Essays and Addresses."

In 1899 Lord Avebury planned a book to be called "The Future of Religion," in which he intended to trace step by step through our human ages all that Religion owes to Science; and how, indeed, "true religion is impossible without Science." The future that he saw was full of hope.

Animal Life.

"There is no species of animal or plant which would not well repay, I will not say merely the study of a day, but even the devotion of a lifetime. Their form and structure, development and habits, geographical distribution, relation to other living beings, and past history constitute an inexhaustible study.

"When we consider how much we owe to the dog, man's faithful friend, to the noble horse, the patient ox, the cow, the sheep, and our other domestic animals, we cannot be too grateful to them; and if we cannot, like some ancient nations, actually worship them, we have perhaps fallen into the other extreme, underrate the sacredness of animal life, and treat them too much like mere machines."—"The Beauties of Nature."

Natural History.

"The study of natural history, indeed, seems destined to replace the loss of what is, not very happily, I think, termed 'sport': engraven in us as it is by the operation of thousands of years, during which men lived greatly on the produce of the chase. Game is gradually becoming 'small by degrees and beautifully less.'

"Our prehistoric ancestors hunted the mammoth, the woolly-haired rhinoceros, and the Irish elk; the ancient Britons had the wild ox, the bear, the deer, and the wolf. We have still the grouse, the partridge, the fox, and the hare; but even these are becoming scarcer and must be preserved first, in order that they be killed afterwards. Some of us even now—and more, no doubt, will hereafter—satisfy instincts, essentially of the same origin, by the study of birds, or insects, or even infusoria—of creatures which more than make up by their variety what they want in size."—"The Pleasures of Life."

Lord Avebury's Account of his Tame Wasp.

"I kept a specimen of *Polistes gallica* for no less than nine months.

"I took her, with her nest, in the Pyrenees, early in May. The nest consisted of about twenty cells, the majority of which contained an egg; but as yet no grubs had been hatched out, and, of course, my wasp was as yet alone in the world.

"I had no difficulty in inducing her to feed on my hand; but at first she was shy and nervous. She kept her sting in constant readiness; and once or twice in the train, when the railway officials came for tickets, and I was compelled to hurry her back into her bottle, she stung me slightly—I think, however, entirely from fright.

"Gradually she became quite used to me, and when I took her on my hand apparently expected to be fed.

She even allowed me to stroke her without any appearance of fear, and for some months I never saw her sting.

"When the cold weather came on she fell into a drowsy state, and I began to hope she would hibernate and survive the winter. I kept her in a dark place, but watched her carefully, and fed her if ever she seemed at all restless.

"She came out occasionally, and seemed as well as usual till near the end of February, when one day I observed she had nearly lost the use of her antennæ, though the rest of the body was as usual. She would take no food. Next day I tried again to feed her; but the head seemed dead, though she could still move her legs, wings, and abdomen. The following day I offered her food for the last time; but both head and thorax were dead or paralysed; she could but move her tail—a last token, as I could almost fancy, of gratitude and affection. As far as I could judge, her death was quite painless; and she now occupies a place in the British Museum."—"Ants, Bees and Wasps," pp. 315–16.

On Reading.

"Books are to mankind what memory is to the individual. They contain the history of our race, the discoveries we have made, the accumulated knowledge and experience of ages; they picture for us the marvels and beauties of Nature; help us in our difficulties, comfort us in sorrow and in suffering, change hours of ennui into moments of delight, store our minds with ideas, fill them with good and happy thoughts, which lift us out of and above ourselves. . . .

"Many of those who have, as we say, all that this world can give have yet told us they owed much of their purest happiness to books. . . .

"Macaulay had wealth and fame, rank and power, and yet he tells us in his biography that he owed the happiest hours of his life to books. . . .

"If a book does not interest us, it does not follow that the fault is in the book. There is a certain art in reading. Passive reading is of little use. We must try to realise what we read. . . . To get the greatest amount, I will not merely say of benefit, but even of enjoyment, from books, we must read for improvement rather than for amusement. Light and entertaining books are valuable, just as sugar is an important article of food, especially for children, but we cannot live upon it. Some novels are excellent, but too much devotion to them greatly diminishes the pleasure which may be derived from reading. . . .

"The choice of books, like that of friends, is a serious duty. We are as responsible for what we read as for what we do."—"The Pleasures of Life."

"Books, however, though invaluable, cannot teach us everything. For success in life, knowledge of human nature is of the utmost importance."—Address at Heriot-Watt College, Edinburgh.

The Hundred Best Books.

In 1887 Lubbock delivered an address at the Working Men's College on "The Choice of Books." Out of this address grew "The Hundred Best Books," a venture which excited much interest and was very valuable in its own day, and which was the precursor of many excellent series of good and cheap literature; just as his popular books on science—"The Beauties of Nature," etc., helped to prepare the way for all the beautiful Nature books of to-day. The idea of the hundred best books has lately been subjected to that spirit of ridicule for which our age will always be so justly famous. But at the time Sir John Lubbock explained that the list he drew up, which was intended as a guide to international literature for the Englishman in the street, did not consist of those he himself considered the hundred best books, but "of those which have been most frequently recommended as best worth reading." "For instance," he says, "as regards the Sheking and the Analects of Confucius, I must humbly confess that I do not greatly admire either, but I recommended them because they are held in the most profound veneration by the Chinese race, containing 400,000,000 of our fellow men. The 'Ramayana' and 'Maha Bharata' and St. Hillaire's 'Buddha' are not only very interesting in themselves, but very important in reference to our great oriental Empire."—Preface to "The Pleasures of Life."

In short, Sir John Lubbock believed that his list was composed of books "which every one might read with advantage"; but his choice was severely criticised even in his own time, though in a different spirit. For instance, Ruskin violently condemned "the rubbish and poison" which he had recommended. But, to quote Lubbock's own words: "I confess to being somewhat relieved when, on looking through the books which he had struck out of my list, I found they included, amongst others, Marcus Aurelius, Aristotle, Confucius, Thomas à Kempis, Kingsley, Thackeray, Macaulay, and Emerson, so that I hope I had not done so much harm, after all."—"Essays and Addresses."

The Pleasures of Home.

"We love the ticking of the clock, and the flicker of the fire, like the sound of the cawing of rooks, not so much for any beauty of their own as for their associations. . . .

"No one who has ever loved mother or wife, sister or daughter, can read without astonishment and pity St. Chrysostom's description of woman as 'a necessary evil, a natural temptation, a desirable calamity, a domestic peril, a deadly fascination, and a painted ill.'

"In few respects has mankind made a greater advance than in the relations of men and women. It is terrible to think how women suffer in savage life; and even among the intellectual Greeks, with rare exceptions, they seem to have been treated rather as housekeepers or playthings than as the Angels who make a Heaven of home."—"The Pleasures of Life."

Friendship.

"It is well and right to be courteous and considerate to every one with whom we are brought into contact, but to choose them as real friends is another matter. . . . Those who have ever really loved anyone will have some tenderness for all. . . . Let us then choose our friends carefully for what they are, not for what they have . . . and having made a friend, keep him.[1] . . . Friendship does not confer any privilege to make ourselves disagreeable."—"The Pleasures of Life."

Childhood.

"It is customary, but I think it is a mistake, to speak of 'happy' childhood. Children are often over-anxious and acutely sensitive. Man ought to be man and master of his fate: but children are at the mercy of those around them. Mr. Rarey, the great horse-tamer, has told us that he has known an angry word raise the pulse of a horse ten beats in a minute. Think then how it must affect a child!

"It is small blame to the young if they are over-anxious; but it is a danger to be striven against."—"The Pleasures of Life."

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[1] "A good friend is one of the greatest blessings Providence can send you."—Address to the students of Heriot-Watt College, Edinburgh.

Moral Education.

"We have unduly neglected moral education in our schools, and one result has been that children often grow up believing vice to be pleasant. . . . The very reverse is the truth."—"The Pleasures of Life."

The Uses of Pain.

"Much of what we call evil is really good in disguise. . . . Pain is a signal of danger, a very necessity of existence. But for it, but for the warnings which our feelings give us, the very blessings by which we are surrounded would soon and inevitably prove fatal. Many of those who have not studied the question are under the impression that the more deeply-seated portions of the body must be the most sensitive. The very reverse is the case. The skin is a continuous and ever-watchful sentinel, always on guard to give us notice of any approaching danger: while the inner organs, where pain would be without purpose, are, so long as they are in health, comparatively (and the brain itself, the temple of thought, the seat of all suffering and enjoyment, entirely) devoid of sensation. . . .

"If, however, we cannot hope that life will be all happiness, we may at least secure a heavy balance on the right side; and even events which look like misfortunes, if boldly faced, may often be turned to good. . . . Helmholtz dates his start in science to an attack of illness."—"The Pleasures of Life."

Free Will.

"It is impossible to deny the existence of evil, and the reason for it has long exercised the human intellect. The savage solves it by supposition of evil spirits. . . . Freedom of action, however, seems to involve the existence of evil. If any power of selection be left us, much must depend on the choice we make. . . .

"This divine gift it is for us to use wisely. It is, in fact, our most valuable treasure. . . . Moreover, even if evil cannot be altogether avoided, it is no doubt true that not only whether the life we lead be good and useful, or evil and useless, but also whether it be happy or unhappy, is very much in our own power, and depends greatly on ourselves. . . . No one was ever yet made utterly miserable excepting by himself. We are, if not the masters, at any rate almost the creators of ourselves. . . . How happy home might generally be made but for foolish quarrels, or misunderstandings, as they are well named! It is our own fault if we are querulous or ill-humoured; nor need we, though this is less easy, allow ourselves to be made unhappy by the querulousness or ill-humour of others."—"The Pleasures of Life."

Anticipation of Evil.

"Not only do we suffer much in the anticipation of evil, as 'Noah lived many years under the affliction of a flood, and Jerusalem was taken unto Jeremy before it was besieged,' but we often distress ourselves greatly in the apprehension of misfortunes which after all never happen at all. . . . We often hear of people breaking down from overwork, but in nine cases out of ten they are really suffering from worry or anxiety. . . ."

Another time Lord Avebury explains that this he supposes to be the sense in which we are told to "take no thought for the morrow," but to "consider the lilies of the field," etc.; for, he says, "it would indeed be a mistake to suppose that lilies are idle or imprudent. On the contrary, plants are most industrious, and lilies store up in their complex bulbs a great part of the nourishment of one year to quicken the growth of the next. Care, on the other hand, they certainly know not."—"The Pleasures of Life."

Anger.

"Our own anger indeed does us more harm than the thing which makes us angry, and we suffer much more from the anger and vexation which we allow acts to rouse in us than we do from the acts themselves at which we are angry and vexed. How much many people, for instance, allow themselves to be distracted and disturbed by quarrels and family disputes. Yet in nine cases out of ten one ought not to suffer from being found fault with. If the condemnation is just, it should be welcome as a warning; if it is undeserved, why should we allow it to distress us?"—"The Pleasures of Life."

Epicureanism.

"Contentment, we have been told by Epicurus, consists not in great wealth, but in few wants. In this fortunate country, however, we may have many wants, and yet, if they are only reasonable, we may gratify them all. Nature indeed provides without stint the main requisites of human happiness. . . ."—"The Pleasures of Life."

Self-Control.

"We possess mysteriously a sort of dual nature, and there are few truer triumphs, or more delightful sensations, than to obtain thorough command of ourselves. How much pleasanter it is to ride a spirited horse, even perhaps though requiring some strength and skill, than to creep along upon a jaded hack. In the one case you feel under you the free, responsive spring of a living and willing force; in the other you have to spur a dull and ifeless slave.

"To rule oneself is in reality the greatest triumph."—The Pleasures of Life."

The Duty of Happiness.

"Life is a great gift, and as we reach years of discretion we most of us naturally ask ourselves what should be the main object of our existence. . . . Our own happiness ought not, of course, to be our main object, nor indeed will it ever be secured if selfishly sought. We may have many pleasures in life, but must not let them have rule over us, or they will soon hand us over to sorrow. . . . I cannot, however, but think that the world would be better and brighter if our teachers would dwell on the Duty of Happiness as well as on the Happiness of Duty; for we ought to be as bright and genial as we can, if only because to be cheerful ourselves is a most effectual contribution to the happiness of others. . . . There is no doubt some selfish satisfaction in yielding to melancholy, and fancying that we are victims of fate, in brooding over grievances, especially if more or less imaginary. To be bright and cheerful often requires an effort: there is a certain art in keeping ourselves happy: and in this respect, as in others, we require to watch over and manage ourselves almost as if we were somebody else. If we do our best; if we do not magnify trifling troubles; if we look resolutely, I do not say at the bright side of things, but at things as they really are; if we avail ourselves of the manifold blessings which surround us, we cannot but feel that life is indeed a glorious inheritance."—"The Pleasures of Life."

The Adventure of Life.

"We read of and admire the heroes of old, but every one of us has to fight his own Marathon and Thermopylæ: every one meets the Sphinx sitting by the road he has to pass: to each of us, as to Hercules, is offered the choice of Vice or Virtue: we may, like Paris, give the apple of life to Venus, or Juno, or Minerva. There are many who seem to think that we have fallen on an age in the world when life is especially difficult and anxious, when there is less leisure than of yore, and the struggle for existence is keener than ever. On the other hand, we must remember how much we have gained in security! It may be an age of hard work, but when this is not carried to an extreme it is by no means an evil. If we have less leisure, one reason is because life is so full of interests. Cheerfulness is the daughter of employment, and there never was a time when thought was freer, or when modest merit and patient industry were more sure of reward."—"The Pleasures of Life."

Religion.

"Theology and Dogma are the science, but not the essence, of religion. . . . We may not be able to tell whence we came or whither we go, we may not be sure what to think or believe, but in our hearts we almost always know well enough what we ought to do. The duty to our neighbour is part of our duty to God. . . . The love of God is best shown by the love of man. . . . Think on what is good, and you will not do what is bad. . . . Crimes are not committed in deed until they have often been committed in thought. . . .

"But yet, however much we have sinned, passage after passage, promise after promise, forbid anyone to despair. . . . There are noble sentiments in Plato and Aristotle and Epictetus, in Seneca and Marcus Aurelius, but there is no such complete gospel of Love as that in the New Testament. . . . Jesus specially contrasted it with the teaching of Moses, as enjoining repeated forgiveness, and love even to enemies. . . . But even if much more were expected of us, if great sacrifices were demanded, if we were called on to give up everything in this world, how short life is! . . . We must aim at perfection. . . . We have been assured that we have no real cause for fear. . . ."—"The Use of Life."

The Church of England.

"I feel with St. Augustine: 'Let others argue, I will wonder'—at any rate till we have more light. But the craving for dogmatic theology as a basis for religion exists, and we must recognise it. Now among all the Churches none seems to me to be wider, more tolerant, more progressive, more truly Catholic and Christian, than the Church of England. . . . The Church is the national recognition of the great mystery of existence."—Address to the Churchmen's Union.

The Medical Profession.

"We scarcely realise, I think, how much we owe to doctors. Among the lower races of men pain and illness are often attributed to the presence of evil spirits. The Medicine Man is a Priest, or rather a Sorcerer, more than a true Doctor, and his effort is to exorcise the evil spirit.

"In other countries where some advance has been made a charm is written on a board, washed off, and drunk. In some cases the medicine is taken, not by the patient, but by the doctor. Such a system, however, is generally transient; it is naturally discouraged by the Profession, and is indeed incompatible with a large practice."—"The Pleasures of Life."

The Basis of Happiness.

"If we are ever in doubt what to do, it is a good rule to ask ourselves what we shall wish on the morrow that we had done.

"Moreover, the result in the long run will depend not so much on some single resolution, or on our action in a special case, but rather on the preparation of daily life. Battles are often won before they are fought. To control our passions we must govern our habits and keep watch over ourselves in the small details of everyday life. . . .

"But we cannot expect to be happy if we do not lead pure and useful lives. To be good company for ourselves we must store our minds well, fill them with pure and peaceful thoughts, with pleasant memories of the past, and reasonable hopes for the future. We must, as far as may be, protect ourselves from self-reproach, from care, and from anxiety. We shall make our lives pure and peaceful by resisting evil, by placing restraint upon our appetites, and perhaps even more by strengthening and developing our tendencies to good. We must be careful, then, on what we allow our minds to dwell. The soul is dyed by its thoughts; we cannot keep our minds pure if we allow them to be sullied by detailed accounts of crime and sin."—"The Pleasures of Life."

Time and Opportunity.

"Time, indeed, is a sacred gift, and each day is a little life. Just think of our advantages here in London! We have access to the whole literature of the world; we may see in our National Gallery the most beautiful productions of former generations, and in the Royal Academy and other galleries the works of the greatest living artists. Perhaps there is no one who has ever found time to see the British Museum thoroughly. Yet consider what it contains, or rather what does it not contain? The most perfect collection of living and extinct animals and plants, the marvellous monsters of geological ages, the most beautiful birds, shells, and minerals; precious stones and fragments from other worlds, curious specimens illustrating different races of men; exquisite gems, coins, glass, and china; the Elgin marbles, the remains of the Mausoleum, of the Temple of Diana of Ephesus; ancient monuments of Egypt and Assyria; the rude implements of our predecessors in England, who were coeval with the hippopotamus and rhinoceros, the musk-ox and the mammoth; and beautiful specimens of Greek and Roman art.

"Suffering may be unavoidable, but no one has any excuse for being dull. And yet some people are dull. They talk of a better world to come, while whatever dullness there may be here is all their own."—"The Pleasures of Life."

Love.

"Love is the light and sunshine of life. We cannot fully enjoy ourselves, or anything else, unless someone we love enjoys it with us. Even if we are alone, we store up our enjoyment in hope of sharing it hereafter with those we love. There is such instinctive insight in the human heart that we often form our opinion almost instantaneously, and such impressions rarely change, I might even say they are seldom wrong. Love at first sight sounds like an imprudence, and yet is almost a revelation."—"The Pleasures of Life."

Colour and Sound.

"We do not, I think, sufficiently realise how wonderful is the blessing of colour. It would have been possible, it would even seem probable, that, though light might have enabled us to see objects, this would only have been by shade and form. How we perceive colour is not yet understood, and yet, when we speak of beauty, among the ideas which come to us most naturally are those of birds and butterflies, flowers and shells, precious stones, skies, and rainbows.

"Our minds might have been constituted exactly as they are, we might have been capable of comprehending the highest and sublimest truths, and yet, but for a small organ in the head, the world of sound would have been shut out from us; we should have lost all the varied melody of nature, the charms of music, the conversation of friends, and have been condemned to perpetual silence. A slight alteration in the retina, which is not thicker than a sheet of paper, not larger than a finger nail, and the glorious spectacle of this beautiful world, the exquisite variety of form, the glow and play of colour, the variety of scenery, of woods, and lakes and hills, seas and mountains, the beauty of the sky alike by day and night, would all have been lost to us."—"The Pleasures of Life."

The Beauties of Nature.

"There are doubtless some to whom none of the beautiful wonders of Nature, either the glories of the rising or setting sun, the magnificent spectacle of the boundless ocean, sometimes so grand in its peaceful tranquillity, at others so majestic in its mighty power, the forests agitated by the storm or alive with the song of birds, nor the glaciers and mountains—there are doubtless some whom none of these grand spectacles can move. Such men are indeed pitiable. But, happily, they are exceptions."—"The Pleasures of Life."

The Destiny of Man.

"It will, I think, be admitted that, of the evils under which we suffer, nearly all may be attributed either to ignorance or to sin. That ignorance will be diminished by the progress of science is, of course, self-evident; that the same will be the case with sin seems little less so. Thus, then, both theory and experience point to the same conclusion. The future happiness of our race, which poets hardly ventured to hope for, science boldly predicts. Utopia, which we have long looked upon as synonymous with an evident impossibility, which we have ungratefully regarded as 'too good to be true,' turns out, on the contrary, to be the necessary consequence of natural laws, and once more we find that the simple truth exceeds the most brilliant flights of the imagination.

"Even in our own time we may hope to see some improvement; but the unselfish mind will find its highest gratification in the belief that, whatever may be the case with ourselves, our descendants will understand many things which are hidden from us now, will better appreciate the beautiful world in which we live, avoid much of that suffering to which we are subject, enjoy many blessings of which we are not yet worthy, and escape many of those temptations which we deplore, but cannot wholly resist."—"Prehistoric Times."

Patriotism.

"If ever there was a country for which a man might work with pride, surely it is our own . . . as regards size, a mere speck on the ocean. . . . In our history there has no doubt been much to regret. . . . But, on the whole, in war we have shown much generosity to our enemies. At the end of the great struggle with Napoleon, when the power of France was crushed and the Allies occupied Paris, we agreed to terms which left France her territories and colonies intact (on the sole condition, as regards the latter, that she would agree to surrender the slave trade), and free from debt, while we ourselves had incurred one, mainly arising from the war, of over £900,000,000! When we look back on the terms, our statesmen behaved with a generosity which was perhaps hardly wise, and we can scarcely wonder that some Frenchmen claim Waterloo as a French victory. At any rate, the terms of Peace were far more favourable to them than to us. . . . Peace, we know, hath her victories as well as war, and if we turn to the history of human progress we have equal reason to be proud of our forefathers. . . . I do not mention these facts as any credit to us—they are a great honour to our fathers, and we are proud of them—but they impose on us a grave responsibility."—"The Use of Life."

Our Fiscal Policy.

"The word Protection sounds well, but it is misleading. The fact is that a country can only protect one trade at the expense of the others. . . . Trade is uncertain enough without these artificial complications. Under protection, in addition to all other problems, the merchant and manufacturer have to consider the intentions of Government and of Parliament. Parliament itself is distracted, and tempted by the claims of rival industries. . . . It is often said that, while Free Trade would be good if adopted generally, it is a disadvantage if other countries are protectionists. On the contrary, Free Trade is best in any case. The more a country shuts up its own market, the more it excludes itself from others. . . . If, indeed, there were no imports, we should be giving away our exports, which nobody would propose. . . . One central question on which the electors will have to make up their minds is, Can any country tax the foreigner? I believe not to any substantial extent. It seems to me clear that as a general rule the existence of a duty raises the price rather more than the mere amount of the duty. . . . This is, of course, the free trade view, and it is also the view on which protection is based, for the object of protective duties is to shut out foreign goods, thus raising prices at the expense of the consumer for the benefit of the manufacturer. . . . What, then, will be the effect of the new policy? Firstly, we shall have the expense of additional officials and custom houses, which will involve no slight expense. Secondly, it will be a considerable impediment to trade, because not only must bales, etc., containing the taxed articles be examined, but others also to see that they do not contain taxed goods. Besides which difficult questions will arise as to smuggling. Thirdly, the agriculturists and other consumers will have to pay heavily for the benefit of the manufacturers. Fourthly, the manufacturers and other consumers will have to pay heavily for the benefit of the agriculturists (under the present proposal in the form of a dole, therefore taxation). Fifthly, as the advantage or disadvantage to any class will depend on the amount of the protective duties they have to receive, as compared with those they have to pay, there will be a constant struggle in Parliament, and we have an alarming vista of bribery and corruption. And sixthly, we shall raise acute and probably angry questions with foreign countries and our own Colonies, some of which are amongst the countries with high protective duties. . . .

"The desire for closer relations between different parts of the Empire is important and satisfactory. . . . But we have given our Colonies long ago a free market for their produce, while they almost all endeavour to exclude our manufactures by high duties. We do not ask them to exclude foreign manufacturers. What we wish is that they should treat us as we treat them. . . . I confess I view with some alarm the prospect of bargaining with our Colonies (*sub* the Dominions). We may seem to favour one Colony, or one interest; and may find that, instead of closer union, we have roused jealousies, suspicions, and animosities. . . . As men of business, the Government cannot expect us to do anything which will cripple or endanger that magnificent commerce on which the comfort and prosperity of our people so greatly depend."—"Essays and Addresses."

The Condition of Europe.

"The sufferings and hardships of the working classes —sufferings which cannot be reduced as long as the present expenditure is maintained—are leading to a rapid development of socialism. Socialism, I fear, would only aggravate the evil, but it is the protest of the masses against their hard lot. Unless something is done, the condition of the poor in Europe will grow worse and worse. It is no use shutting our eyes. Revolution may not come soon, not probably in our time, but come it will, and as sure as fate there will be an explosion such as the world has never seen. If the monarchs of Europe are to retain their thrones, and if we are to maintain peace, European statesmen must devise some means of fostering better feelings, and diminishing the burdens which now press so heavily on the springs of industry, and aggravate so terribly the unavoidable troubles of life."

These words were spoken in the House of Lords in 1906, and will be found in the chapter on the Peace of Nations in "Peace and Happiness." They are also quoted by Jack London in "The Iron Heel."

Germany and England.

"Germans and Englishmen know that whatever course a war between us might take, whichever might be nominally the victor, the result could not but be disastrous to both, would throw us both back a hundred years and inflict indescribable misery and suffering on both nations."—"Peace and Happiness."

"We have been at peace with Germany for a thousand years; in fact, we have never had a war, and yet some few in both countries, and a part of the Press, are doing their best to stir up strife between us. . . .

"'*The refusal of arbitration* is the precise feature that will enable neutral opinion in nearly every case to range itself on one side.' Surely then, if two great Powers cannot settle their differences for themselves amicably, they will submit them to arbitration.

"As things now stand, indeed, any country which declares war without reference to arbitration is guilty of a great crime, and must be regarded as an enemy of the human race!"—Article on "Inter-Racial Problems" in the *Fortnightly Review*, October 2nd, 1911.

His last book, "Peace and Happiness,"[1] ended with an appeal to the "so-called civilised nations of the world" to reduce their armaments, and especially to Great Britain to lead the way to peace. "On all accounts it is most important that we should endeavour to avoid international misunderstandings and to strengthen friendly feelings between the great nations of the earth. A reduction of armaments would be an enormous boon to the whole world, and especially to the people of Europe; it would, I believe, save the Continent from drifting into revolution and misery. It would diminish the burden of taxation, it would lighten the hours of labour, it would raise wages and lower the price of necessaries; and the highest ambition that any nation can place before itself is that it may take a foremost place in the noble work of promoting 'peace on earth and goodwill amongst men.'"[1]

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[1] "Marriage, Totemism, and Religion" was actually published two years later, but it was an answer to critics and had been written in the form of articles in the course of several previous years.

It is comforting to know that we did our best along these lines, although we failed.[2]

"But" (as we know to our cost) "a nation, however reasonable, however just, however unaggressive, cannot always ensure peace. It is always liable to be driven into war if it is so unfortunate as to have a turbulent, ambitious, and unscrupulous neighbour.

"On the other hand, no one can absolutely destroy the peace of mind of anyone but himself. . . . No number of small troubles can make a great sorrow if we resolutely refuse to add them together. . . . The more we think for others, or the less we think of ourselves, the happier we shall be. . . . Some think there can be no peace in this life. That is a mistake. . . . Suffering and sorrow we must indeed all expect, but it is our own fault if we have not a heavy balance of happiness. Nothing, in fact, is expected of us that it is not our own interest to fulfil: everything which is wrong is also unwise in itself. The ill-tempered man makes himself more unhappy than anyone else; the miser cannot enjoy money; the glutton and the drunkard turn the natural and innocent enjoyment of food into a cause of misery and degradation; the man who works seven days a week breaks down; the idle and ignorant know nothing of the beautiful world in which we live, the glorious and ennobling treasures of art, literature, and science; the selfish and unkind man loses the inestimable blessing of the confidence and love of friends and relations. Day by day the bad man sinks lower and lower, ruins his body and degrades his mind, loses one source of happiness after another, his false pleasures turning to torments, finds himself surrounded by strangers or enemies, while both body and mind are racked with suffering and misery—all the harder to bear because he has brought them on himself, and last, not least, haunted by apprehensions for the future. While the good man, as the years run on, finds life easier and happier; his conscience is at peace, he has rich stores of bright thoughts and happy memories, and is blessed by the inestimable comfort of grateful and loving friends, and a peaceful and happy home, and above all 'the peace of God, which passeth all understanding.'"—"Peace and Happiness."

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[1] "Colonel House had found (June 1914) Germany in a most belligerent frame of mind, its army 'ready,' to use the Kaiser's own word, for an immediate spring at France; on the other hand he had found Great Britain in a most pacific frame of mind, entirely unsuspicious of Germany, and confident that the European situation was improving" ("Life and Letters of Walter H. Page," pp. 319–20).

[2] "The derisory rejection by Germany in 1913 of Mr. Churchill's suggestion of a naval holiday had been necessarily followed by our resolute response to the challenge thrown down by the (German) Navy Law of 1912" ("Genesis of the War," by Rt. Hon. H. H. Asquith).

LIST OF DATES IN THE LIFE OF LORD AVEBURY

P.C.; D.C.L. (Oxon); LL.D. Cantab., Dublin, Edin., St. Andrews; M.D. (Wurzburg); Commandeur de la Légion d'Honneur, France; Prussian Ordre pour le Mérite, and Foreign Member or Corresponding Member of over thirty Societies.

1834. Born April 30th.
1843. Went to Mr. Waring's school at Abington.
1845. At Eton till 1848.
1849. Entered the family Banking House (then Lubbock Forster & Co.).
,, Elected a member of the Royal Institution.
1850. Gave his first lecture. It was on the Wireworm, and delivered at Down to the villagers.
1851. Joined Kent Artillery Militia.
1853. Attended meeting of the British Association for the first time.
1856. Married Ellen Hordern, only child of Rev. Peter Hordern. She died 1879.
,, Originated the system known as Country Clearing.
1858. Elected a Fellow of the Royal Society.
1861. Elected a member of the Council of the Royal Society.
1863. Hon. Sec. London Bankers.
1864. Elected a Fellow of the Society of Antiquaries.
1864–5. President Ethnological Society.
1865 (May). Published his first book, "Prehistoric Times" (Williams & Norgate).
,, First stood for Parliament (West Kent) as a Liberal candidate, but was defeated.

1865. Succeeded his father in the baronetcy; appointed his father's successor on the Senate of London University.

1866–7. President of Entomological Society.

1866. Suggested at a meeting of the London Bankers, and carried, publication of Clearing House Returns.

1868. Served on Royal Commissions on Public Schools, and on International Coinage (*i.e.* "to consider the proceedings of the Monetary Conference held in Paris last year, and to report on the adaptability of their suggestions to our own monetary system").

,, President of International Association of Prehistoric Archæology.

1869. First President of the Metaphysical Society (see p. 24).

1870 (Feb.). Published second book: "The Origin of Civilisation and the Primitive Condition of Man" (Longmans, Green & Co.).

1870–80. Liberal M.P. for Maidstone.

1870. Maiden Speech (in House of Commons) on Military Education, advocating that greater attention should be given to Science.

1871. Bank Holidays Act passed.[1]

,, Monograph on the Collembola and Thysanura (published by Ray Society).

1871–2. Vice-President of the Royal Society; and again 1878–79, 1892–94.

1871–3. President Royal Anthropological Institute.

1872–80. Vice-Chancellor of University of London.

1873 (Oct.). "The Origin and Metamorphoses of Insects" (Macmillan).

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[1] A list of the Bills Lord Avebury introduced into Parliament and which passed into law will be found in an Appendix to this list.

1874 (Nov.). "British Wild Flowers considered in relation to Insects" (Macmillan).

1874–5. Served on Royal Commission on Scientific Instruction.

1878. Appointed a Trustee of the British Museum.

1879 (May). "Addresses, Political and Educational" (Macmillan); (June) "Scientific Lectures" (Macmillan).

1879–83. First President of Institute of Bankers.

1880–1900. M.P. for University of London.

1881. President British Association.

1881–86. President of the Linnean Society.

1881–1913. President of the Ray Society and Treasurer 1860–68.

1882 (Jan.). "Fifty Years of Science" (Macmillan)—being his Presidential Address (fifty years' anniversary) at the British Association 1881.

,, "Ants, Bees and Wasps" (Kegan Paul, Trench & Co.).

,, In conjunction with Mr. Bouverie and others, founded a Company to introduce Edison's system of Electric lighting into Great Britain.

1883. Hon. LL.D. Cambridge. Hon. D.C.L. Oxford.

1883–98. Principal of the Working Men's College.

1884. Married Alice Fox Pitt, daughter of General Pitt Rivers.

1884–1913. President of the Proportional Representation Society.

1885 (June). "On Representation" (Swan Sonnenschein & Co.).

,, Tried to bring about Arbitration Treaty with U.S.A.

1886 (Feb.). "Flowers, Fruits, and Leaves" (Macmillan).

,, "Chapters in Popular Natural History" (National Society).

1886. Delivered the Rede Lecture at Cambridge, "On the Forms of Seedlings and the causes to which they are due."

„ President Walford College of Science.

„ Split with Gladstone over Home Rule—joined the Liberal Unionists (retaining his seat for London University by a majority of 3 to 1; his opponent was Mr. Frederic Harrison).

„ Served on Royal Commission on Elementary Education.

1887–88. Served on Royal Commission on Gold and Silver.

1887 (June). "The Pleasures of Life," Part I. (Macmillan).

1888. "The Senses of Animals" (Kegan Paul, Trench & Co.).

1888–89. Chairman of Public Accounts Committee.

1888–93. President London Chamber of Commerce.

1889. Privy Councillor.

„ (April). "The Pleasures of Life," Part II. (Macmillan).

1889–90. Vice-Chairman of London County Council.

1890–92. Chairman of London County Council.

1890–98. Chairman of Council of Foreign Bondholders, of which he had been Vice-Chairman for sixteen years.

1891. Chairman of Committee to settle designs of coinage.

„ Asked to mediate on account of threatened Omnibus Strike—as previously in the Dock Strike, Coal and Gas Consumers' difficulties, etc.

1892 (Oct). "Beauties of Nature" (Macmillan).

„ "Seedlings," 2 vols. (Kegan Paul, Trench & Co.).

1893. First President International Institute of Sociology.

1893–1913. President of the Selborne Society.

1894–1902. President of London University Extension Society until 1902, when merged in the University of London.

1894 (Oct.). "The Use of Life" (Macmillan).

1896 (June). "The Scenery of Switzerland" (Macmillan).

1897. President International Zoological Association and Congress.

,, President International Library Association and Congress.

,, President Gold Standard Defence Committee.

1898-1913. President of Central Association of Bankers.

,, ,, Chairman of Committee of London Clearing Bankers.

1899. President Royal Historical Society.

,, "Buds and Stipules" (Kegan Paul, Trench & Co.).

1900. Peerage.

,, Attended the meeting of the Associated Chambers of Commerce held in Paris, which paved the way for the *Entente Cordiale.*

1900–2. President of Royal Statistical Society.

1900–13. President of Council of Foreign Bondholders.

1902 (Feb.). "The Scenery of England" (Macmillan).

,, "Coins and Currency" (John Murray).

1902–3. President African Society.

1902. Chairman of Committee formed to suggest British Candidate for Nobel Prize for Literature. (The prize was awarded to Herbert Spencer.)

,, Chairman at a dinner given by the Athenæum Club to the members of the Order of Merit.

1903. Commander of Legion of Honour.

,, Received the first Prestwich medal from the Geological Society.

1903 (Dec.). "Essays and Addresses" (Macmillan).

1904 (May). Book on "Free Trade" (Macmillan).

1904–8. President Society of Antiquaries.

1904–13. Foreign Secretary—Royal Academy of Arts.

1905. Chairman of first meeting of Anglo-German Friendship Society.
,, (Nov.). "Notes on Life History of British Flowering plants" (Macmillan).
1906 (Nov.). "On Municipal and National Trading" (Macmillan).
1906–8. President Sociological Society.
1907–9. President Royal Microscopical Society.
1908. Rector of St. Andrews University.
1909 (Feb.). "Peace and Happiness" (Macmillan).
1911. "Marriage, Totemism and Religion" (Longmans).
1913. Jan. 21st. Chairman of Free Trade Meeting of City men (see p. 45).
,, Jan. 22nd. Attended City meeting to protest against Representation Bill.
,, Feb. 22nd. Attended British Museum meeting at which Piltdown Skull exhibited.
,, Feb. 27th. Received complimentary address from the Anglo-German Friendship Committee.
,, Died at Kingsgate Castle on May 28th.

LIST OF BILLS INTRODUCED BY LORD AVEBURY WHICH PASSED INTO LAW

1871. Bank Holidays Act.
1873. Tithe Commutations Act Amendment Act.
1874. Apothecaries Act.
,, Falsification of Accounts Act.
1875. College of Surgeons Act.
1876. University of London Medical Act Amendment Act.
1877. Absconding Debtors Act.
1878. Dental Practitioners Act.
1879. Bankers Books Evidence Act.
1880. Wild Birds Protection Act.

1882. Ancient Monuments Act.
,, Bills of Exchange Act.
1883. Companies Colonial Registers Act.
1884. Greek Marriages Act.
1886. Shop Hours Regulation Act (limiting the hours of labour of young persons under 18).
1889. Factory Act Amendment Act.
1890. Open Spaces Act.
,, Metropolis Management and Buildings Acts Amendment Act.
1892. Public Libraries Act.
1898. Companies Acts Amendment Act.
1900. Seats for Shop Assistants Act.
1901. Ancient Monument Act Amendment Act.
1903. County Courts Jurisdiction Extension Act.
1904. Shop Hours Act (Early Closing).
1905. Closing of Licensed Premises (Christmas Day) Act.
1906. Limited Partnership Act.
1907. Companies (Debentures) Act.
1908. Municipal Franchise Companies Bill.
,, Sunday Closing (Shops) Bill.
,, Importation of Plumage Prohibition Bill.

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